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LOS ANGELES

A VOLUME OF LETTERS FROM Dr. BERKENHOUT TO HIS SON AT THE UNIVERSITY.

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TO THE RIGHT HONORABLE

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THOMAS,

LORD VISCOUNT WEYMOUTH,

THIS VOLUME

IS INSCRIBED

BY HIS LORDSHIP'S

FAITHFUL, HUMBLE SERVANT,

THE AUTHOR.

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PREFACE.

THESE letters were written partly for the writer's amuſement, but principally with the deſign of introducing the young *freſh*-man, to whom they were addreſſed, to an early acquaintance with the elements of the ſciences he was about to cultivate: they were not deſigned, in any degree, to ſuperſede, or render leſs neceſſary, the inſtructions of his college-tutors; rather, on the contrary, to facilitate the cultivation, by clearing the ſurface of its indigenous weeds, and thus preparing the freſh land for the reception of the plough.

Young minds naturally incline to frivolous diſſipation; they cannot continue long inactive; it ſeems therefore neceſſary to allure them to rational purſuits, before trifling becomes a habit.

A faſtidious examiner, will, in theſe epiſtles, find ſufficient matter for criticiſm; but, I hope, he will allow me to plead the privilege of that inattention to abſolute preciſion and methodical arrangement, which, in familiar

miliar letters, it were unjuſt, and perhaps improper, to require. The variety of ſubjects on which I have indulged my ſpeculations, may make the volume appear a *maze*, but, I truſt, *not without a plan*; a plan of which no judgement can be formed from the few pages contained in this volume. The ſubjects are frequently varied, on purpoſe to relieve the attention, and to avoid the formality of a ſyſtematic treatiſe.

I have preſumed, in ſome parts of theſe epiſtles, to cenſure the preſent ſyſtem of education in both Univerſities; but I have alſo acknowledged them, in their preſent ſtate of imperfection, equal to the production of very learned men: nevertheleſs, the entire ſyſtem is too obviouſly Gothic to eſcape the ridicule of ſtrangers, who viſit Oxford and Cambridge with the idea, that the *Eccleſia Anglicana* is a *reformed* Church, and that theſe formal ſeminaries are appropriated to the education of nobility, of gentlemen, ſtateſmen, lawyers, phyſicians, and divines.

In the botanical letters, I may be accuſed of pedantry in too frequently *larding the lean earth* with Latin quotations; but the reader muſt not forget the age and recent

ſtudies

ſtudies of him to whom they were addreſſed, and that nothing ſo effectually fixes a new idea in the mind, as attaching it to an old one.

Thoſe who, in the peruſal of this volume, expect to find amuſement, will probably be diſappointed: if it prove in any degree, inſtructive to young ſtudents, the deſign of its publication is anſwered.

I muſt now beg the reader's indulgence whilſt I expoſtulate a little with a fraternity of periodical critics, who aſſume the title of *Analytical Reviewers*, relative to a late publication of mine, entitled *Synopſis of the Natural Hiſtory of Britain*, &c. Theſe critics, or rather the individual who did me the honour to review that book, after allowing it ſome merit, writes thus — "In the vegetable kingdom, the author juſtly acknowledges the aſſiſtance he had from the works of Hudſon, Lightfoot, Curtis, and Withering, moſt of whoſe plants he has adopted, rather too implicitly, for not one of their errors, even the moſt notorious, is corrected."

The accuſation may be juſt. Poſſibly I may have depended too implicitly on what I believed to be ſubſtantial authority; but ſurely it was incumbent on the reviewer to pre-

prevent the propagation of theſe errors, by a ſpecific charge. This ſort of general criticiſm, is, in the higheſt degree, illiberal, becauſe it can anſwer no purpoſe, ſave that of depreciating the book.

In the preſent inſtance I was thruſt into the *condemned-hole* with four eminent, very eminent, botaniſts. Such company might have rendered the dungeon tolerable: but, conſidering myſelf as the inſtrument of their condemnation, I thought myſelf obliged to juſtify them if it were in my power. With this intention, I wrote to the publiſher of the *Analytical Review*, requeſting, that the writer of the article in queſtion would do me the favour, to point out a few of the *notorious* errors, which he had diſcovered in the *Synopſis*; errors which, notwithſtanding their notoriety, had eluded the obſervation of the other Reviews; errors which, with a view to the greater accuracy of a future edition, I ſincerely wiſhed to find, but which I had ſought for in vain. To this requeſt I received no anſwer, either privately, or in any of their ſubſequent publications.

LET-

LETTERS, &c.

LETTER I.

Trumpington, June, 1789.

——— "*All the world is a ſtage,*
And all the men and women meerly players:
They have their exits and their entrances,
And one man in his time plays many parts,
His acts being ſeven ages."——

I NEED not tell you, that theſe lines begin the admirable ſpeech of *Jaques* in the ſecond act of Shakeſpear's *As you like it*. Theſe ſeven ages are, that of the infant, the ſchool-boy, the lover, the ſoldier, the juſtice, the pantaloon, and ſecond childhood. This diviſion is poetically juſt; but it is not generally applicable. The three material *epochas* in the life of a man liberally educat-

ed, are—his admiſſion at a grammar-ſchool, his matriculation at the univerſity, and his departure thence. Theſe three periods, like the three primitive colours, are diſtinctly marked. Shakeſpear's ſeven ages reſemble Sir Iſaac Newton's ſeven priſmatic tincts, four of which are intermediate ſhades, produced by the mixture of the primitive red, blue and yellow.

You, my dear boy, have played your part in the firſt of theſe three acts of the great *drama* of life; and I hope your performance hath been ſuch as to be no diſgrace to the ſtage on which you appeared. In this act you have ſpent eight years of your terreſtrial exiſtence, with all the advantages of a public ſchool. If it be true that, from the age of ten to eighteen, the mind is moſt capable of permanent impreſſions, it were rational to expect that a young gentleman, thus educated, ſhould enter the univerſity poſſeſſed of all the learning neceſſary to conſtitute the foundation of his future ſtudies.

The public ſchools, in this kingdom, profeſſedly, teach nothing but the Greek and Latin languages; and even of theſe, at the expiration of ſeven or eight years, many of the lads have acquired a very ſuperficial know-

knowledge. They may perhaps be able to conſtrue a few pages in the books that have been put into their hands; but are totally loſt if you try them in a Greek or Latin author which they have never ſeen. Would not one be hence naturally led to imagine, that theſe two dead languages are very difficult to learn? — Yet, you have the pleaſure to know a young lady to whom Latin and Greek are perfectly familiar; who is likewiſe an arithmatician, an algebraiſt, a geometrician; plays the harpſicord very finely, ſings well, dances in a ſuperior ſtyle, and is, in ſhort, with all her learning, miſtreſs of every female accompliſhment.

Now, though I am ready to acknowledge, that this ſingular accumulation of acquirements may, in a great degree, be aſcribed to a ſuperiority of capacity, it demonſtrates, nevertheleſs, that wonderful effects may be produced by a proper mode of inſtruction.

The queſtion, why boys learn ſo little during ſeven or eight years continuance at a public ſchool? is not difficult of inveſtigation. Half that period is conſumed in vacations and ſingle holidays. It ſhould ſeem therefore, that in our eſtimate of the *quantum* of learning, we muſt reduce the eight years

to four; but this were a falſe eſtimate; for, from theſe four years, we muſt ſubtract the time required to regain what has been abſolutely forgotten and loſt during the ſeveral total ceſſations from learning; and, on a very fair computation, this conſideration will deduct two years from the four: ſo that our eight years are reduced to two; and I will venture to affirm that, under a better ſyſtem, boys might, in two years, be taught all they uſually learn, at any of our public ſchools, in eight.

There is another material impediment in the progreſs of a boy at a public ſchool. I mean the gothic cuſtom of ſuffering the under boys to be the ſervants, the ſlaves, of the upper. Regardleſs of the cruelty of ſubjecting a child to the irrational caprice of a lad of fifteen; regardleſs of the injury he muſt ſuſtain in being conſtantly deprived, by the mandates of his tyrannical maſter, of the ſleep which nature, at that age particularly, requires; regardleſs of that ignominious habit of ſervility which this infamous ſyſtem muſt neceſſarily induce; regardleſs, I ſay, of theſe conſiderations, the menial ſervices to which cuſtom obliges him to attend, leave him little or no time for

appli-

application to his book. What is the conſequence? — He is conſtantly flogged for neglect of that which it was not in his power to execute. There is no appeal. He dares not complain; *that* would but increaſe his ſufferings. He ſubmits to his hard fate, and, in reſpect to learning, his four firſt years are almoſt a total blank. — But I have filled my paper; Adieu!

LETTER II.

I MEAN, in ſome part of this letter, to reſume the ſubject with which I concluded my laſt; becauſe I feel myſelf peculiarly intereſted in the cauſe of thoſe defenſeleſs children, who, whilſt they continue *fags* in a public ſchool, are condemned to greater hardſhips than the African ſlaves whom it is ſo much the faſhion to commiſerate;—becauſe I wiſh to keep alive in your memory thoſe impreſſions which it may be uſeful to future times that you ſhould remember; and becauſe I would have you perfectly comprehend the reaſon, why boys from a public ſchool generally know ſo little when they are firſt ſent to the univerſity.

You have too much good ſenſe to conſtrue what I have ſaid into a diſſatisfaction at your ignorance of things which it is impoſſible you ſhould know. On the contrary, I rather wonder that, under ſuch circumſtances, you have acquired ſo much knowledge of Latin and Greek: Nevertheleſs, if you purſue your claſſical ſtudies, you will ſoon diſcover, that you have

have not yet advanced much farther than the portal to claſſical erudition.

The dead languages are nothing more than the external ſteps to the temple of literary Fame. A mere pedagogue may conſtrue literally every line of Homer, Virgil, Horace, Terence, Cicero, Tacitus, and yet be as ignorant of their real beauties as was Jerediah Buxton of Garrick's excellence, when, during the performance of the play, he attended only to the number of words ſpoken by the actor. The language of the celebrated authors I have mentioned, as language merely, merits, I acknowledge, ſome attention; becauſe a perfect acquaintance with the Greek and Latin languages will enable you to underſtand and to improve your own. Nevertheleſs, if theſe claſſical authors poſſeſſed no merit beyond the mechanical beauty of verbal arrangement and harmony of numbers, they would ill deſerve the time and labour they require.

The ſtrange cuſtom in our public ſchools, which conſtitutes the under boys ſervants to the upper, is ſo exceedingly cruel and unjuſt, that one cannot help being ſurpriſed at its continuance to the preſent enlightened period of human ſociety, when ſo many of

the abſurdities of our progenitors have been aboliſhed. But the cruelty and injuſtice of this cuſtom are not the only arguments in favour of new regulations. This early ſubſerviency and ſubſequent deſpotiſm, muſt eventually prove infinitely prejudicial to ſociety. A boy who, from the age of ten to fourteen, hath been compelled to ſubmit to a degree of ſervitude more irkſom and humiliating than that of his father's loweſt domeſtic; who is taught, by example, that he muſt ſuffer every ſpecies of impoſition and cruelty without complaint; that his books, his trinkets, and even his apparel, are the property of the boy he calls his maſter: ſuch debaſement, I ſay, by thus early bending the mind below the dignity of an Engliſh gentleman, muſt infallibly prepare him for ſubmiſſions inimical to the conſtitution of his country.—He gradually riſes to the upper ſchool. He then becomes a tyrant in his turn, and theſe habits of tamely ſubmitting to the mandates of his ſuperiors, and of capriciouſly tyrannizing over thoſe beneath him, can hardly fail to form a truly deteſtable character. But it were unjuſt hence to infer, that every gentleman educated at our great public ſchools is a compound of

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ſlave and tyrant. There are many examples of the contrary.

The late King of Pruſſia, without any advantage of education, was a great General, a conſummate Politician, an acute Philoſopher, a good Poet and a polite Scholar, even without any knowledge of the dead languages. In like manner, our immortal Shakeſpear, without education, was doubtleſs the firſt of all dramatic poets. It appears therefore, that the characters of men are not invariably caſt in the mould of education, and that even a total want of it cannot prevent ſuperior intellects from riſing above the common level of mankind. Of this truth there cannot be a more ſingular example than the preſent father of the Medical faculty in the Univerſity of Edinburgh. Dr. Cullen I have always regarded as one of thoſe rare beings, whoſe intuitive rays of underſtanding penetrate the clouds of time-ſanctioned erroneous opinions, even without the labour of formal inveſtigation.

But theſe are ſingular examples. Mankind, in general, are the creatures of tuition and habit; we may therefore fairly conclude, that a mixture of ſervility and imperiouſneſs will generally mark the character of young

young gentlemen educated at Weſtminſter, Eton or the Charter Houſe; and hence it is ſurely incumbent on every pupil of theſe ſchools, carefully to examine his acquired propenſities, and to correct the evil before habit ſhall have rendered it an indelible feature is his character. Machiavel, the famous, the infamous, Italian politician, depended ſo much on the effect of cuſtom, that he adviſes princes who wiſh to remove their opponents by aſſaſſination, to employ none but fellows whoſe hands are already ſtained with blood. He reaſoned from a juſt knowledge of mankind. In ſuffering children to torture flies, we ſow the ſeeds of cruelty, which, like the paraſitical Ivy, will grow up with the ſaplen and cling to every branch.

You will in the courſe of your ſtudies at the univerſity neceſſarily become acquainted with *Locke's Eſſay on Human Underſtanding*. He was of opinion that we are born without ideas, and conſequently that all ideas are impreſſions on the brain from external objects, received and communicated by our ſenſes. If this be true, we are entirely the creatures of education, and the difference of character between one boy and another,

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educated at the ſame ſchool, muſt depend on their different capacity, or aptitude to receive and retain the ſame impreſſions. Habits, therefore, of ſervility and ſucceſſive tyranny, will contaminate the diſpoſition of one youth more than another; but every young gentleman emerging from a public ſchool, ſhould examine his diſpoſition with miſtruſt. "Probably (he ſhould ſay to himſelf) from my early habits of ſervility, I am too much inclined to kneel to my ſuperiors; and, in conſequence of my late deſpotic command, I am diſpoſed to tyrannize over my dependents; I am poſitive in my opinions, and too impatient of contradiction."

You have read, I dare ſay, that when Socrates was interrogated concerning his vaſt knowledge, he anſwered that *the chief of what he knew was that he knew nothing*. Sir Iſaac Newton thought ſo humbly of his ſuperior abilities, that he conſtantly aſcribed his wonderful diſcoveries ſolely to application, which he ſaid, was in every man's power. The great Locke entitled his admirable *Treatiſe on Human Underſtanding*, merely *an Eſſay*. From theſe examples, we may rationally conclude, that arrogance makes no part of the character of a great man;

man; that, in purſuit of knowledge, *alps on alps ariſe* before us; that the proſpect extends in proportion to our elevation; and that when we have gained the ſummit of the mountain, the expanſe of ſcience is bounded only by the univerſe.

From this elevation, let us now look back upon yon ſpruce young gentleman at the bottom of the hill. He has juſt left the ſchool which you ſee at a diſtance in the valley. The moment he had ſhook hands with his ſchoolfellows, he runs into a barber's ſhop, and, with a manly importance, ſits down to have his *no-beard* ſhaved off, and his graceful ringlets, bound ridgedly up in the form of a carrot, powdered and perfumed; his *leathers* up to his ribs, blue ſilk ſtockings, harneſs buckles and a club in his hand, he begins his journey towards the temple of Fame. He miſtakes the mountain before him for a ſmooth plane, and, perfectly confident in his acquired *momentum*, he expects to roll on with the rapidity and eaſe of a Phaeton on the turf. Alas! he ſtumbles at the firſt ſtep. He meets, as he aſcends, with difficulties which he did not expect. His reſolution fails. He ſickens at the proſpect before him, and never advances a ſin-

a single step farther. So ends the progress of far the greatest number of students at the university. Indolence, evil habits, and fashionable dissipation, are the universal impediments to useful knowledge and rational acquirements. That you may profit by the contemplation of this picture, is the ardent wish of, dear Charles,

Your, &c.

LET-

LETTER III.

IN my two former letters I have endeavoured to find a reaſon, why boys, educated at any of our public ſchools, come to the univerſity totally ignorant of every thing, except a little Greek and Latin: and that I might let them down as gently as I poſſibly could, I have, and I think juſtly, aſcribed their want of knowledge to a gothic ſyſtem of Inſtruction. The dead languages are doubtleſs the foundation of modern erudition; but certainly more, much more might be acquired in the courſe of ſeven or eight years, if more than half that time were not ſacrificed to cuſtom. It is indeed very extraordinary that, in diſcarding the abſurdities of the Romiſh creed and religious ceremonies, we ſhould have retained ſo much of the ancient mode of education, both in our ſchools and univerſities.

Perhaps I am not juſtifiable in exciting in you an unfavourable idea of the mode of education eſtabliſhed in the univerſity of which you are become a member. But I now ſtart the ſubject, to prevent your ſuddenly

denly drinking the poiſon of diſguſt before you are provided with an antidote.

In the univerſity of Cambridge, though claſſical learning be not neglected, yet mathematical ſtudies are particularly enforced. A young gentleman intended for no profeſſion, who ſpends a few years at the univerſity only becauſe he is yet too young to make the tour of Europe, cannot eaſily be perſuaded that the moſt perfect knowledge of Euclid's Elements can ever be of any uſe to him: he therefore applies reluctantly, or not at all, to the ſtudy of a ſcience from which he can receive no advantage. Thoſe who are deſigned for Law, Phyſic or Divinity, are equally at a loſs to apply mathematics to their ſeveral profeſſions. Very true: mathematical knowledge is not immediately applicable to Law, Phyſic or Divinity; nevertheleſs it is indirectly connected with, and fundamental to, all ſcience. It neceſſarily induces a habit of reaſoning juſtly; it accuſtoms the mind to rational inveſtigation and intenſe thinking. Now, intenſe thinking, without which you muſt always remain on the ſurface of knowledge, is, to common minds, an occaſional and irkſome exertion; but, to a mathematician

it is habitual and eaſy: in all ſubjects of difficulty therefore, a mathematician has an evident advantage; his conceptions will be more diſtinct; his deductions more accurate, and his concluſions conſequently more juſt.

There is yet another very ſtrong recommendation to mathematical ſtudies. I mean amuſement. Excluſive of their univerſal utility, you will find them infinitely entertaining. Few pleaſures are equal to that of ſolving a difficult problem. Comply therefore with the habits of the univerſity; apply yourſelf ardently to the rudiments of mathematical knowledge, and look forward with confidence to the reward of your labour. But, before you proceed, I muſt caution you againſt that fatal *cui bono?* which being a queſtion not always eaſily anſwered, is often conſidered as an *argumentum crucis* againſt the application to a ſcience the utility of which is not immediately obvious. In this turbulent ſea of human life, we ſee but a very few leagues before us. Sagacity and experience, our two beſt teleſcopes, diſcover no land a-head; but that is no proof that we may not, before the next glaſs, fall in with an iſland or continent. Univerſal knowledge is far beyond the reach of human

man capacity; but ſcience is the ſalutary food of the human ſoul, and ſhould therefore be cultivated for its own ſake, totally regardleſs of its uſeful application. We are diſtinguiſhed from the brute creation only in proportion to our mental acquirements, and ſurely every intelligent being would wiſh to remove himſelf as far as poſſible from the brute creation.

Young men are naturally vain and poſitive; dictatorial and dogmatical in their opinions, becauſe they have not learnt to reaſon juſtly, and becauſe they are unacquainted with the arguments by which they might be refuted: and it frequently happens that they are confirmed in their errors by the contemptuous ſilence of Learning and Experience. I ſpeak of young men in general. You have certainly too much penetration not to perceive the abſurdity of juvenile arrogance. I dwell upon this ſubject, becauſe this arrogance is an inſuperable obſtacle to all knowledge.

A young man, fortunately inſpired with an enthuſiaſtic deſire of knowledge, will begin by a ſcrupulous inveſtigation of the nature and degree of the learning which he brings to the univerſity. Probably he will

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diſcover that he knows leſs, even of vulgar arithmetic, than a ſhopkeeper's apprentice, and has leſs knowledge of the world than a gentleman's *Valet de Chambre*. This may poſſibly be conſidered as a very humiliating reflexion to a ſpruce young academician; it is true nevertheleſs; and it is not only true, but the conſciouſneſs of it is the only pedeſtal to his future pillar of Fame. He that does not build upon humility will never riſe to diſtinction. Arrogance is diſguſting even in thoſe who have moſt reaſon to be proud; what then muſt it not be in thoſe who have no pretenſion to eminence? Be not therefore aſhamed to ſay with Socrates, *All I know is that I know nothing*.

What is human knowledge? What are its objects? They are Arts or Sciences. Arts I conſider as manual, mechanical, operations: they are corporal attainments. Sciences, on the contrary, are more immediately objects of the mind. You will find ſome difficulty in drawing a ſtraight line between them, becauſe moſt arts require ſome degree of Science: nevertheleſs, by the help of an example or two, we ſhall poſſibly be able to ſeperate the two ideas, ſo as to keep them tollerably diſtinct.

Muſic,

Muſic, for example, is an *art*, a liberal art. Cramer in executing a difficult *concerto*, whether of his own compoſition or not, is a wonderful *artiſt*; but reſpecting his compoſitions, or his cadences, when really extemporaneous, or invented, he ranks with men of ſcience. In like manner, a painter, who does nothing more than copy objects before him, is a mere artiſt: he is a man of ſcience only in proportion to his diſplay of his knowledge of Nature. A poet may alſo be conſidered as a mere artiſt, when his ſole merit is the accuracy of his verſification.

When you have leiſure to conſult the writings of philoſophers, particularly Ariſtotle and his followers, you will find that they have ſo perplexed themſelves in their diſinition of Arts and Sciences, as to render it impoſſible to diſtinguiſh one from the other. The diſinition of Arts, which I have given you above, may be, ſtrictly, applicable to mechanical Arts only: this however, is ſufficient for our preſent purpoſe.

I am, dear Charles, &c.

LETTER IV.

I CONCLUDED my laſt letter with a conciſe diſcremination of Arts and Science, which together comprehend the objects of human intelligence, and conſequently the objects of your future application. The former are, at preſent, entirely out of the queſtion. Let us therefore take a general view of the latter.

The Sciences, with which you have at this time any concern, are Arithmetic, Geometry, Logic, Rhetoric, Morality, and Revelation, as a branch of Theology. To theſe will be added, a continuation of your Claſſical ſtudies, with ſome attention to Hiſtory. Of theſe ſciences, you are neceſſarily totally ignorant. You have read, or rather conſtrued, a few detached ſcraps of ancient hiſtory; but that was ſolely with regard to the language in which they were written. As to modern hiſtory, and the manners and improvements of different nations in modern times, you have been entirely precluded by your age and ſituation. From theſe conſiderations it neceſſarily follows, that a boy, a young gentle-

gentleman, if you rather prefer that denomination, immediately emerging from ſchool, is in truth, and without any reflexion on his abilities, as I have already obſerved in a former letter, a very ignorant perſonage. He is ignorant of the world, conſequently embarraſſed in his deportment, and totally unacquainted even with the principles of any ſcience whatſoever.

What then muſt we think of thoſe young gentlemen, and ſuch young gentlemen are not very uncommon ſpectacles, who, with all theſe imperfections, inconſiderately daſh their opinions on all ſubjects, in the preſence of Learning and Experience? They are heard with compaſſion, and they retire uninformed.

Are we then, you will aſk, to act the part of mutes?—No: not abſolutely; but a young ſtripling who talks, only becauſe he thinks he ought not to be ſilent, had much better hold his tongue. If he preſume to take the lead in converſation, he muſt infallibly expoſe himſelf; becauſe, like a poor prodigal, he is extravagant without a fund; and, like an ignorant pilot, he runs aground before he has diſcovered the coaſt. If he venture to give his opinion on politics, the

greateſt favour the company can do him is to ſeem to attend to ſomething elſe. If he preſume to decide on the merit of a book, a ſermon, a play, or an actor, it is at leaſt ten to one againſt him, that he is wrong; becauſe a rational determination on theſe ſubjects requires a degree of knowledge to which a ſchool boy can have no pretenſions. If he think proper to entertain the company with a *good ſtory*, it is moſt probably, though new to himſelf and his *quondam* companions, a ſtale joke to many perſons preſent, and poſſibly the wit of a jeſt-book. —As to wit, in general, it is a plaything ſo very like an edged tool, that it is impoſſile a boy ſhould meddle with it without cutting his fingers. But, beſides the danger, there is another reaſon ſufficient to deter a young man from attempting to be witty. I mean the difficulty of immediately diſtinguiſhing real from falſe wit. The firſt may produce ſome degree of applauſe: the latter, nothing better than a ſneer. Every unſucceſsful attempt to be witty, recoils, like an overloaded gun; overturns the author, and expoſes him ſprawling to the deriſion of his companions.

In what I have written concerning the general

neral ignorance of Weſtminſter, Eton, and Charter-houſe ſchool boys, I attribute that ignorance neither to the lads nor to their maſters; but partly to the indolence of men in power, and partly to an apprehenſion of the conſequences of reformation. We like reformation well enough, whilſt, with the reins in our hands, we can ſtop it when we pleaſe; but we are fearful of Reformation run mad. In reading Swift's *Tale of a Tub*, you will learn that it is not an eaſy operation to ſtrip a garment of its ſuperfluous ornaments, without tearing the cloth. This is an argument againſt inconſiderate, irrational reformation; but, if it be admitted as an argument againſt reformation in general, it proves too much. If the great reformer Luther had been deterred by ſuch arguments, all Europe would ſtill have groaned under the eccleſiaſtical tyranny of a ſovereign Pontif. But I have inſenſibly wandered from my ſubject.

I do not mean to inſinuate that a young gentleman, on his firſt admiſſion at the Univerſity, when accidentally in the company of his ſuperiors, ſhould be precluded from taking part in the converſation; but, be his natural abilities ever ſo great, he

ſhould, on no occaſion, preſume to take the lead. His opinions, when aſked, ſhould be delivered with diffidence, and in a manner evidently expreſſing his deſire of better information: and this, not only becauſe ſuch deportment is moſt becoming his ſituation; but becauſe it is the only means by which he can expect to improve by the converſation of men of ſuperior knowledge. Men of ſcience feel a pleaſure in communicating their knowledge to young minds properly diſpoſed for inſtruction; but juvenile arrogance, like the moth which is now wheeling round my candle, in the moment that it ſinges it wings, puts out the light. Nothing ſo effectually ſilences a man of letters as the modiſh tittle-tattle, or deciſive opinions of a young *Etourdie*.

That *man* is naturally a vain animal, appears from his being moſt vain whilſt neareſt a ſtate of nature; that is, before a little education has opened to his view the expanded proſpect of human knowledge; before he is convinced, by experience, that error is interwoven with human nature. This vanity is indeed ſo natural a vice, that no habit is more difficultly acquired than that of acknowledging our errors; and yet this habit

bit is the beſt feature in an amiable character, and the ſtrongeſt proof of a ſound underſtanding.

The late King of Pruſſia, whom, when you have read his poſthumous volumes, you will conſider as a man of ſuperlative abilities, concludes his deſcription of every battle which he fought, with an impartial recapitulation of his own miſtakes, and frequently with a generous acknowledgment of the better conduct of his enemy.

Beſides the vanity, in young men, of appearing to know more than any young man can poſſibly know, there is another ſpecies of pride to which youth in general is extremely prone. I mean that of appearing rich. Now, though no young man be weak enough to maintain, that riches imply the leaſt degree of merit in the poſſeſſor, yet the idle vanity of being ſuppoſed to have a large allowance to ſpend, is more generally the cauſe of ruin to ſtudents at the Univerſity, than any natural propenſity to extravagance.

Every attempt to appear more learned, more knowing, more powerful, or richer than we really are, is fooliſh in the extreme; for, if we ſucceed at all in the deception, it

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is of very ſhort duration. In diſpite of every effort to keep up the ball, it will ſoon come down, and will deſcend with greater force in proportion to its height. The individual characters of men, howſoever artfully ſuſtained, will infallibly vibrate to their true level in the opinion of the world, and the pretender will find himſelf at laſt, like the ſpirt of a fountain, even below the ſurface of his parent reſervoir; below his natural level.

Vera gloria, ſays the charming Cicero, *radices agit, atque etiam propagatur: ficta omnia celeriter, tanquam floſculi, decidunt, nec ſimulatum poteſt quidquam eſſe diuturnum.*

Vale.

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LETTER V.

WE of the human ſpecies are diſtinguiſhed from what we call *the brute creation*, not by the internal or external formation of our bodies; for, in theſe, the difference is found, by naturaliſts, too inſufficient to entitle us even to a ſeparate *Order* in the claſs of Quadrupeds. The celebrated Linnæus has placed *Man* in the CLASS *Mamalia*, which includes Quadrupeds and Whales; and in the ORDER *Primates*, which, according to his artificial ſyſtem, neceſſarily comprehends the genus *Veſpertilio*. He does not even compliment us with a *generic* diſtinction. A *ſpecific* difference is all that we are allowed: thus, *Homo rationalis*. I am ſorry to obſerve, that even this *trivial* epithet is more than we generally deſerve.

I am compelled to be thus ſevere on the human *ſpecies* (for you obſerve we have no pretenſion to a *generic* diſtinction) becauſe mankind appears to me the leaſt rational part of the creation: Therefore I would not tranſlate the word rationalis *rational*; but, *capable of reaſoning*.

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Old men are frequently cenſured for their want of indulgence to the natural follies of youth. Is it then neceſſary that young men ſhould be fools? If ſo, what becomes of this ſpecific epithet which alone divides them from the brute creation? Or, muſt they rank with brutes until a certain age?

I am led to theſe animadverſions by obſerving, that young men, on their firſt ſtarting into life, are generally governed ſo abſolutely by that fool Faſhion, as totally to forget that they are rational creatures; and that in point of dreſs (for of that only I am now ſpeaking) they are ready to ſacrifice every idea of propriety, and even convenience, to the ridiculous whim of any deſpicable inſect of what is called the *beau monde*.

You are not hence to conclude, that I would have a young gentleman too ſcrupulouſly attentive to the rationality of his dreſs. Something muſt be ſacrificed to Faſhion; but a young man of ſound intellects will not, in compliance with the whim, even of a prince, run into extremes that are palpably abſurd. I would not have my ſon a ſloven. Total negligence of dreſs is an affront to ſociety: it indicates either an ignorance or contempt of the world; but an

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abſolute Fop is a creature almoſt below contempt. Dreſs, in the eye of philoſophy, is an inconſiderable object; but it is an object of no ſmall influence in the opinion of mankind. The opinion of the world is of great conſequence to a young man: on ſtrangers, propriety or impropriety of dreſs, make the firſt impreſſion. Firſt impreſſions are not eaſily obliterated; dreſs, therefore, howſoever inſignificant in the abſtract, becomes an object of importance to every member of ſociety, particularly to a young man on his firſt appearance in the great world.

You are become a member, and I hope you will prove not an unworthy member, of one of the firſt Univerſities in Europe; and of a college that has produced many eminent, very eminent men. But, alas! the number of men diſtinguiſhed for ſuperior knowledge and abilities, is far exceeded by the number of drones that have iſſued from the hive, and have mixed with the illiterate part of mankind, undiſtinguiſhed and forgotten.

To what cauſe ſhall we attribute this lamentable exceſs of ignorance, in the number of perſons educated at Oxford and Cambridge?

bridge? It muſt, I think, be aſcribed to a variety of cauſes, partly acting upon each other, and ſome of them totally independent. The firſt cauſe, which operates alike in both Univerſities, is a poſitive adherence to ſtatutes and cuſtoms, which, not according with the preſent improved ſtate of learning, nor with the manners of the preſent times, fatigue and diſguſt the ſtudents immediately on their admiſſion. Extreme early riſing and conſtant attendance in the chapel, are hardſhips in which they perceive no utility. They comply with reluctance. They are diſguſted with an academical life. They reſide no longer than is abſolutely neceſſary, and they look forward with impatience to the day of their releaſe. In ſuch a temper, little improvement can be expected. No young man will apply to learning *con amore*, in a diſagreable ſituation.

I am, nevertheleſs, far from thinking, that young gentlemen ſhould be entirely unreſtrained; but I am of opinion, that theſe reſtrictions ſhould be confined to their immoralities, and that in all other reſpects their reſidence at the Univerſity ſhould be rendered as agreeable to themſelves as poſſible. There is a principle in human nature

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ſo averſe to coercion, particularly about the age of ſixteen, that the lectures of your tutors make very little impreſſion, becauſe they are attended by compulſion. In every other Univerſity in Europe, attendance upon lectures is a voluntary act: no taſks, no exerciſes are impoſed. Nevertheleſs, the public lectures are univerſally attended, and the ſtudents liſten with an eager deſire of information: becauſe their attendance is voluntary.

It cannot be denied, that the colleges in our Engliſh Univerſities retain an obvious ſimilitude to Roman Catholick Convents; and it is very ſurprizing that the Reformation ſhould have produced ſo little, ſo very little, alteration in their inſtitutes, habits and regulations; many of which are totally indefenſible on principles either of policy or utility.

In theſe ſtrictures, I have told you nothing that you did not know before; nothing with which the whole world is not as well acquainted as myſelf: nor have I diſcovered any blemiſhes that are not ſeen and felt by every rational member of both Univerſities. Why then, you will aſk, are no ſteps taken towards reformation?

You remember Æſop's fable of the mice and the cat. Who will hang the bell? A firſt Reformer is ſure to create many enemies. It is very difficult to ſtem and divert into another channel, a torrent of prejudice that has been ſo many years accumulating, without being carried down with the ſtream. But ſuch a reformation requires a power which the Univerſities themſelves do not poſſeſs. It muſt be the act of the Legiſlature; and the Adminiſtration, in this kingdom, is generally too deeply involved in national politicks, to ſpare the time and application that a reform of ſuch importance would require.

It is poſſible that, in ſome future period, a fortunate concurrence of circumſtances may produce a rational and uniform ſyſtem of education in both Univerſities. There are now reſident at Oxford and at Cambridge, men fully adequate to the delineation of a comprehenſive, an univerſal plan of academical tuition, which, with the advantages of their preſent foundations, might, very eaſily, be rendered ſuperior to any inſtitutions of the kind in Europe. No other Univerſities poſſeſs ſuch noble and ſpacious edifices for the accommodation of ſtudents;

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no Univerſities are ſo munificently endowed; no other Univerſities poſſeſs ſuch public and college libraries; and certainly no ſeminaries of learning can boaſt ſo many members of diſtinguiſhed erudition in every branch of literature: but theſe ſingular advantages are ſacrificed to an unavoidable (*unavoidable*, in the preſent ſtate of things) compliance with ancient ſtatutes, manners, and cuſtoms.

LETTER VI.

I HAVE, in my laſt letter, acknowledged the defects which foreigners obſerve in the general economy of Engliſh Univerſities. They are aſtoniſhed to find that our profeſſorſhips are commonly ſinecures; that there is no continued ſeries of public lectures in arts or ſciences; and that college tutors are almoſt the only ſources of information. This naturally creates ſurprize; becauſe, in all other Univerſities, the ſtudents have the advantage of daily public lectures, without vacation or interruption, during the greateſt part of every year. What is the cauſe of ſuch laborious attention of the profeſſors in theſe Univerſities?—The anſwer is obvious. They are paid by their auditors, who are under no obligation to attend them; conſequently their emoluments depend on their reputation.

Thus have I candidly, and without reſerve, recapitulated the articles of accuſation, which, in your hearing, have been frequently brought forward, in objection to an Engliſh academical education; and I will now

now endeavour to anſwer theſe objections, ſo far as the ſubject may influence your purſuits.

Young men are naturally ſanguine in their expectations: they are impatient and diſſatisfied with every thing, which, according to their conceptions, falls ſhort of perfection. But a few years experience will infallibly convince them, that human inſtitutions are incapable of perfection, and that a prudent man will make the beſt uſe in his power of things as they are. That the preſent ſyſtem of education at Oxford and Cambridge might be improved, will be readily admitted; and, that a careful reviſion of the ſtatutes, and a conſequent abolition of many cuſtoms, ill adapted to the learning and manners of the preſent age, will take place, is more than probable. But, the fortuitous events neceſſary to bring forward ſo conſequential a revolution, depend on ſo ſingular a coalition of circumſtances, that many ages may yet roll on, before our Univerſities are perfectly reformed.

Let us now attend a little to facts. The arguments deduced from ſpeculation and theory are certainly againſt us. Our Uni-

verſities are governed by ancient ſtatutes, and habits apparently not calculated to produce, either learned men, or polite ſcholars. Yet theſe Univerſities have produced a Bacon, a Newton, a Locke, a Sanderſon, a Bentley, a Tillotſon, a Sherlock, an Addiſon, a Bolingbroke, a Steel, a Cheſterfield, a Pitt; beſides many other learned men, polite ſcholars, and great ſtateſmen. If therefore we may reaſon from facts, an Engliſh Univerſity, with all its imperfections, is fully competent to the communication of claſſical, philoſophical, and polite literature to their greateſt extent: nor do we find that any other ſeminaries, in this iſland or on the continent, can exhibit a liſt of worthies, in any degree comparable with the graduates of Oxford and Cambridge, from the latter end of the laſt century to the preſent time.

Yet this fact, indiſputable as it may appear, does not prove the perfection of our academical inſtitutions; but it ſufficiently demonſtrates the poſſibility of acquiring at Oxford or Cambridge, knowledge in a very high degree, in every branch of literature; and hence, we are fairly authorized to conclude,

clude, that the ignorance of thoſe who diſgrace the Univerſities, cannot with juſtice be aſcribed to the want of opportunity.

To corroborate what I have ſaid in favour of our Engliſh Univerſities, and at the ſame time to relieve you, in ſome degree, from the didactic dulneſs of theſe parental epiſtles, I will endeavour to give you a ſketch of the portraits of ſome of thoſe men whom I have mentioned as ornaments to the ſeminaries in which they were educated.

Francis Bacon, the ſon of Sir Nicholas Bacon, Lord Keeper of the Great Seal, in the reign of Elizabeth, was born in 1561. In the twelfth year of his age, he was entered a Student of Trinity College, Cambridge. By this early admiſſion, you perceive, that Students in the Univerſities, during the firſt three or four years, were ſchool boys; and hence, we may probably account for the prevalent continuance of grammatical and claſſical learning, at one Univerſity, and for the cuſtom of ſcholaſtic impoſitions in both.

Such however was the genius and application of this boy, that, by the time he was ſixteen, he is ſaid to have completed the circle of the ſciences then taught, and to

have been perfectly acquainted with the Ariſtotelean philoſophy; the abſurdity of which philoſophy he immediately diſcovered and finally refuted. What this philoſophy was, I ſhall tell you another time.

About the age of ſixteen, an age when young gentlemen of the preſent times uſually enter the Univerſity, he quitted Cambridge, and was, ſoon after, ſent by his father to Sir Amias Pawlet, who was then the Queen's ambaſſador at the court of France. During his reſidence at Paris, about the nineteenth year of his age, he wrote a ſhort treatiſe *Of the State of Europe*. On the ſudden death of his father, being deſtitute of proper ſupport, he returned to England and commenced ſtudent of the Law, and with ſuch ſucceſs, that after paſſing through the uſual gradations, he became Lord High Chancellor of England, and was created Viſcount St. Albans.

During this progreſs to the ſummit of honour, power and emolument, he continued his philoſophical ſtudies with unremitting aſſiduity, and was doubtleſs, not only the firſt Lawyer, but the *firſt*, I might have ſaid, the *only* philoſopher then in the world. But, alas!—I wiſh, for the honour

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of human nature, that I could draw a vail over the ſequel of his ſtory. This great, this very great man, wanted that integrity of character, that conſtitutional virtue, without which, all other endowments are, to uſe the words of St. Paul, *ſounding braſs and tinkling cymbals.* — He was accuſed of having been influenced in his decrees by pecuniary bribes, received at various times, to a conſiderable amount; and, though it appeared that his ſervants were the only gainers by ſuch malpractice, yet he pleaded guilty, and was ſentenced to pay a fine of 40,000l. — to be impriſoned during the King's pleaſure, and to be for ever incapable of office.

Theſe ſevere pains and penalties were entirely remitted by the King (James I.) by whom, and by his favourite the Duke of Buckingham, the delinquent was now more than ever careſſed. He had a penſion of 1200l. and an additional grant of 600l. from the Alienation office. His own eſtate produced about 700l; ſo that he retired to his philoſophical ſtudies with an income of 2,500l. per annum: nevertheleſs, his debts, at the time of his death, amounted to 22,000l.

Theſe facts, if facts they really be, ſeem ſtrangely incongruous: yet they are well authenticated. It is moſt probable that he was ſeduced by the King to plead guilty, in order to divert the ſtorm of enquiry from falling on the head of Buckingham. If this be true, his character, deliniated by Pope, in the following lines, was moſt juſt.

"If parts allure thee, think how Bacon ſhin'd,
The wiſeſt, brighteſt, meaneſt of mankind."

He ſeems to have been a ſingular example of a mind capable of ſacrificing conſcience, reputation and every rational ſource of felicity, at the ſhrine of Pluto, yet without avarice; and, what is more extraordinary, without being, in any degree, a ſenſualiſt.

His moral character out of the queſtion, he will always be remembered, as a principal ornament to the Univerſity in which he was educated, and as the prototype of the Newtonian philoſophy. "He was, ſays Mr. Walpole (in his *Catalogue of Noble Authors)* the Prophet of Arts *(Sciences,* he ſhould have ſaid) which Newton was ſent afterwards to reveal."

Probably the great Sir Iſaac would have found his way without a guide; neverthe-

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leſs, Bacon, doubtleſs, firſt marked the path to true philoſophy, which Newton afterwards purſued.

"Alas!"—exclaims Mr. Walpole—"that he who could command immortality, ſhould have ſtooped to the little ambition of power!"—This exclamation ſounds well: but there are readers, who, after a little analytical reflexion, might aſk, whether a man of ſuperior talents might not rationally prefer *the little ambition of power*, to the *great ambition of immortal fame?* a reality to a phantom. A man of Bacon's talents might have wiſhed for power for the ſake of his country. Probably a conſtitutional indolence was the cauſe of his inattention to the cuſtomary venality of his dependents: yet perhaps not *indolence*, but a predominant propenſity to philoſophical thinking. That in winking at the venality of his ſervants, he did not act from principle, may, I think, be juſtly inferred from the following paſſage in his Eſſay on Judicature.

"For that which concerns Clerks, and Miniſters: the place of Juſtice is an hallowed place, and therefore not only the bench, but the foot-pace, and precincts, and purpriſe

priſe thereof, ought to be preſerved without ſcandal and corruption."

To find a man of Bacon's ſuperior abilities act, whether from indifference or from attention to other objects, diametrically oppoſite to his own principles, is rather a painful diſcovery: ſuch examples however are not without their utility. They teach us that the good faculties of the brain, without the good faculties of the heart, are totally inſufficient to form an eſtimable character. Conſcious integrity of conduct, would have afforded Bacon more real felicity than all his wealth, his power and philoſophical immortality.

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LETTER VII.

JOHN MILTON, the celebrated author of *Paradiſe Loſt*, was born in London in the year 1608, imbibed the rudiments of his education at St. Paul's ſchool, thence was admitted of Chriſt College, Cambridge, where, at the age of 24, he took his ſecond degree in Arts. His father intended him for the church; but he was now become an enthuſiaſt in the religion which was afterwards the inſtrument of Cromwell's uſurpation. Muſic and poetry were his favourite ſtudies. His *Comus*, *l'Allegro*, *il Penſeroſo*, and *Lycidas*, were written ſoon after he left the Univerſity. They are poems, with which, when you have leiſure to read for amuſement, you will be exceedingly delighted.

About the year 1638, Milton made the tour of France and Italy. During his reſidence at Florence, he wrote ſome Latin verſes, in conſequence of which, Salvaggi of Rome ſent him this diſtich,

Græcia Meonidem jactat ſibi Roma Maronem:
Anglia Miltonum jactat utrique parem.

Mr.

Mr. Dryden, many years after, took the hint, and wrote the following lines in praiſe of Milton,

Three poets in three diſtant ages born,
Greece, Italy and England did adorn:
The firſt in majeſty of thought ſurpaſs'd,
The next in gracefulneſs, in both the laſt.
The force of Nature could no farther go,
To make a third ſhe join'd the former two.

At Naples, he became acquainted with the celebrated Baptiſta Manſo, who at his departure complimented him thus,

Ut mens, forma, decor, facies, mos, ſi pietas ſic,
Non Anglus, verum, Hercule! angelus ipſe fores.

To underſtand the meaning of this *ſi pietas ſic*, you muſt know, that Milton was ſo imprudent a bigot, as to avow his Preſbyterian opinions in the midſt of bigots to an oppoſite creed.

On his return to England in 1639, he commenced maſter of an academy in Alderſgate ſtreet, in which occupation he continued till the execution of Charles I. and the conſequent uſurpation of Oliver Cromwell, by whom he was appointed Latin Secretary to the Counſel of State. In 1652 he

he became blind, nevertheleſs, he continued in his office till the reſtoration of Charles II. who, notwithſtanding Milton's virulent writings in oppoſition to that reſtoration, included him in the general amneſty. He now retired to a ſmall houſe in the Artillery-walk, leading to Bunhill-fields, where he finiſhed his Paradiſe Loſt. He died in 1674, aged 66.

Paradiſe Loſt, the *opus majus* of this our only heroic poet — except Glover, whoſe Leonidas poſſeſſes conſiderable merit — you will read with great delight; particularly as it will frequently bring to your memory many ſublime paſſages in Homer and Virgil. Doubleſs it has ſome blemiſhes, which a reader of chaſte diſcernment and claſſical taſte, will eaſily perceive; but theſe blemiſhes are abundantly counterpoized by a ſublimity of imagination and harmony of numbers, equal, if not ſuperior, to the moſt admired poems of antiquity. If you ſhould ever wiſh to read Italian poetry — this idea obtrudes itſelf rather abruptly — no matter: if I had now ſuffered it to eſcape, it might poſſibly never have recurred — If, I ſay, you ſhould ever wiſh to be acquainted with the Italian poets — and ſome of them

deſerve

deſerve your acquaintance—let me adviſe you to read Rolli's Tranſlation of *Paradiſe Loſt*, with the original before you. Thoſe who are ſuperficially acquainted with the Italian language, will ſuppoſe it incapable of reflecting Milton's ſublimity; but they will find themſelves miſtaken. The Italian language, though ſoft and fluent, is nevertheleſs copious and comprehenſive. Rolli, in his tranſlation, has loſt very few of Milton's ideas.

He was buried in St. Giles' church, Cripple-gate. In 1737 a monument of Milton was erected in Weſtminſter Abbey, at the expence of Mr. William Benſon, auditor of the impreſt. If you wiſh to know more of Milton, you will find various Lives of him in the Libraries, particularly thoſe by Toland, Philips, Richardſon, Fenton, Birch; and in the *Biographia Britannica*, you will ſee the facts in theſe ſeveral Lives concentered.

I ſhall now give you a ſketch of a man whom all nations acknowledged to have been the glory of human nature: the man of whom our moſt correct and moſt harmonious poet, hath ſaid with great felicity of imagination,

" Superior

" Superior Beings when of late they ſaw
A mortal man unfold all Nature's law,
Admir'd ſuch wiſdom in an earthly ſhape
And ſhew'd a Newton as we ſhew an Ape."

Theſe lines, probably, are not new to you; but there is ſo much originality in the idea, that it is almoſt impoſſible to think of NEWTON without repeating them.

He was born on Chriſtmas-day, 1642, at Woolſtrop in Lincolnſhire; received the early part of his education in the grammar-ſchool at Grantham, and was admitted, at the age of eighteen, of Trinity College, Cambridge. At this time mathematics were pretty generally taught by the Tutors. The firſt book put into young Newton's hand, was *Euclid's Elements*. He caſt his eye over it, and was immediately maſter of every propoſition. He thought the book too eaſy to deſerve much attention; but he afterwards acknowledged his miſtake, and was ſorry for it. In 1665, that is, in his 22d year, he invented the *method of Fluxions*, by the help of which, he is ſaid, in the ſpace of two years, to have carried the doctrine of *infinite ſeries* almoſt to perfection. You will know what this means, when you become acquainted with the writings of this human prodigy.

prodigy. In 1667 he was elected Fellow of his College; in the ſame year he took his Maſter of Arts degree, and two years after, on the reſignation of Dr. Barrow, was choſen Profeſſor of Mathematics. During the firſt three years after his elevation to this dignity, he read lectures on Optics, and on communicating his theory of light and colours to the Royal Society, he was, in 1672, elected F.R.S.

This new theory of Light and Colours, though perfectly true, met with conſiderable oppoſition, and prevented him from publiſhing his Lectures on Optics. His ſubſequent diſcovery of that univerſal principle in Nature, called *gravity*, by which he explained, in the moſt ſatisfactory manner, the vaſt ſyſtem of the univerſe, ſhared, for a time, the ſame fate. Men were unwilling, at once, to relinquiſh the then eſtabliſhed philoſophy of Des Cartes, with whoſe theory of the univerſe, the world in general was ſatisfied.

This French philoſopher, Des Cartes, was a man of conſiderable abilities, an able geometrician, and of an inventive genius. At the time of his appearance in France, the philoſophy of Ariſtotle was taught in all

all Univerſities in Europe. This prevalent philoſophy, he, in a great meaſure, overturned. He began by proving the exiſtence of *matter* in oppoſition to Ariſtotle, who ſaid, *non eſt quid, nec quantum nec quale.*

I will now give you a ſketch of the hypothetical ſyſtem of this celebrated French philoſopher. — He imagined three diſtinct ſpecies of elements.

1ſt. Infinitely minute, and of no determined figure, but conſiſting of particles ready to adapt themſelves to every interſtice between the globules which compoſe the ſecond, and thereby prevent a vacuum.

2dly. An element compoſed of atoms perfectly ſpherical, produced by the continued friction of the angular and more groſs particles of the third element, which being firſt created and ſuppoſed to be rapidly whirled round its centre — *circa centra ſua gyrare* — gradually rubbed off its angles, and theſe filings — *ramenta illa quæ e corporibus eruuntur* — formed the firſt element that filled up the chinks.

3dly. An element compoſed of the groſs particles of matter, exceeding the firſt and ſecond in magnitude, leſs fit for motion,

but better calculated for adheſion. Theſe form the groſſer bodies.

Sol et *Fixæ* are compoſed of the firſt element; *Cælum* of the firſt and ſecond; opake bodies, ſuch as comets and planets, of the third.

According to this philoſopher, rarefaction is cauſed by the introduction of celeſtial matter into the pores of denſer bodies: *cauſa ordinaria*, he ſays, *ignis eſt, quia cum particulæ materiæ ſubtilis, quibus conſtat, in continuo ſint motu, facile aliorum corporum meatus ingrediuntur atque illos dilatant et extendunt.*

Gravitation he explains thus: Denſe bodies having leſs propenſity to fly from the centre round which they are whirled, remain neareſt that centre, where they are conſtantly preſſed by the more ſubtile elements. In anſwer to the objection, that, according to this hypotheſis, bodies falling to the Earth ſhould deſcend with moſt rapidity at firſt, paſſing then through the thineſt medium, he ſays — *Diverſitatem lapidis inde oriri, quod lapidis, in ſuo deſcenſu, motus precedentis et inſuper augmentum recepit, ab impulſu materiæ ſubtilis.*

In ſpeaking of compound motion, he ſays, — *Omnia*

—*Omnia enim motus qui a duabus aut pluribus cauſis pendet, eſt compoſitus:* ſo a ball out of a canon deſcribes a curve towards the Earth, becauſe its direct progreſs is impeded by the air, and becauſe heavy bodies deſcend ſloweſt at firſt.

Such were the philoſophical opinions of the celebrated Des Cartes: opinions which, as they were built on *the baſeleſs fabric of a viſion*, would in time have *melted into thin air*; but the ſudden oriental blaze of our great philoſophical luminary, diſpelled them like a morning miſt before the ſun. The ſimple power of gravitation appeared at firſt an hypotheſis; but it was an hypotheſis confirmed by experiment, and demonſtratively explanatory of the motions of the planets that conſtitute our ſolar ſyſtem. This ſyſtem, and the Newtonian philoſophy in general, I may probably delineate more at large in ſome future letters. I ſhall finiſh the preſent biographically.

Mr. Newton's celebrated *Philoſophiæ Naturalis Principia Mathematica*, was firſt publiſhed in 1687, by the Royal Society, under the inſpection of Dr. Halley. In the following year, he was elected member of Parliament for the Univerſity of Cambridge;

in 1696, was made Warden, and three years after, Maſter of the Mint, a place worth 1500l. per annum. In 1703, he was choſen Preſident of the Royal Society, which he continued during the remainder of his life. He died in the year 1727, aged 85, and was buried in Weſtminſter Abbey, where you will find his tomb on the left hand, at the entrance into the choir; which tomb, I dare ſay, you will viſit with more heart-felt veneration than Mahomedans feel at the ſhrine of their prophet at Mecca, or Roman Catholicks at Loretto.

I forgot to tell you, that he was knighted by Queen Ann, in the year 1705. It was a trivial circumſtance, ſcarce worth notice in the life of a Newton, on whom titles conferred by princes, could perpetuate no honour, except to themſelves.

JOHN LOCKE, univerſally remembered, as the author of the *Eſſay on Human Underſtanding*, was born at Wrington in Somerſetſhire, in 1632. He was firſt educated at Weſtminſter ſchool, and thence became a Student of Chriſt-church, Oxford, where he took his degrees in Arts. In 1664, he went abroad as Secretary to Sir William Swan, Envoy

Envoy to the Elector of Brandenburgh. In the following year he returned to Oxford, and was ſoon after introduced to Lord Aſhley (afterwards Earl of Shaftſbury) who being made Chancellor, appointed him Secretary of Preſentations. The plan of his celebrated *Eſſay* was ſketched in 1670. In 1675, Mr. Locke took the degree of Bachelor of Phyſic, and the ſame year went to Montpelier for the recover of his health, where he continued till the year 1679. In 1682, his patron fled to Holland, to illude a proſecution for high treaſon, where he ſoon died. Mr. Locke attended him in his exile, and did not return to England till 1688, the year of the revolution. On his arrival in England, he retired to the ſeat of Sir Francis Marſham, where he ſpent moſt of his time. In 1695, King William appointed him a Commiſſioner of Trade and Plantations, which office he reſigned in 1700, and died in 1704, aged 73.

Mr. Locke was, doubtleſs, a man of very ſtrong intellects; very capable of intenſe thinking, and peculiarly happy in the arrangement of his ideas. His *Eſſay on Human Underſtanding* is Logick diveſted of its ancient technical formality. It is a book

that you will read with great pleaſure and profit, as ſoon as you are capable of cloſe application. Intenſe thinking is an operation of the mind, to which, at ſchool, you were not accuſtomed. It is a habit of which young minds are incapable, and, like ſtrength of body, to be acquired only by gradual exerciſe. But, though Locke be very juſtly conſidered as a claſſical author at the Univerſities, let me adviſe you never implicitly to ſubmit your own reaſon to any of his opinions. Whenever you are not perfectly convinced, mark the paſſage, and diſpute the matter with your companions. Remember however in all your diſputations, that the diſcovery of truth is your ſole object; that it is of no conſequence whether it be found by your antagoniſt or yourſelf; that an honeſt diſputant will admit the arguments of his opponent in all their energy; that every ſpecies of ſophiſm is inadmiſſible; and that the leaſt appearance of paſſion is not only diſadvantageous to the diſputant, but is, at the ſame time, a decided proof of his want of that urbanity, which diſtinguiſhes a gentleman from thoſe who have not had the advantage of a liberal education.

I have dwelt a little upon this ſubject of

diſ-

diſputation, becauſe pertinacity is a common, I had almoſt ſaid an univerſal vice of young men. I well remember it in myſelf. I well remember that I was moſt tenacious of my opinions, when I was moſt ignorant; and that, in proportion as I acquired more knowledge, I became more diffident. Since I kneel at the chair of confeſſion, I will tell you, very honeſtly, that I recollect many inſtances in myſelf, of juvenile arrogance and ſelf-ſufficiency, for which I ought to have been ſeverely chaſtized. My father had from Nature too much of *the milk of human kindneſs* to treat me as I deſerved.

Here I cloſe my biographical ſketches for the preſent. Bacon, Milton, Newton, Locke, are the four great pillars which ſupport the monument of Britiſh genius: a monument, which, without national partiality, we may affirm, ſtands eminently ſuperior to that of any other nation. I have ſpoken of them chronologically; but, Sir Iſaac Newton, doubtleſs, deſerves the firſt place in the group. Bacon had the merit of diſcovering, that former philoſophers began at the wrong end; that philoſophical doctrines built upon hypothetical principles, were incapable of demonſtration, and therefore

might be falſe; and that all ſound philoſophy muſt be founded on facts proved by experiment. This Bacon ſaw; but he went no farther. Like Moſes, from Piſgah, he beheld the land of promiſe at a diſtance; but Newton led the hoſt into the Canaan of Philoſophy.

I am, &c.

LET-

LETTER VIII.

OBSERVING the various fortunes of young men, iſſuing from the ſame ſchool, with the ſame advantages, and apparently of equal capacity, ſome philoſophers have been induced to aſcribe the exaltation or depreſſion of individuals, to a power which they call an irreſiſtible deſtiny. The conſequence of this Calviniſtical tenet is abſurd, becauſe it is incompatible with every principle of morality: the difficulty of a logical proof of this abſurdity, ariſes from the impoſſibility of tracing effects to their cauſes.

You are probably not unacquainted with the amuſement on a bowling-green. Every competitor aims his bowl at the *jack*, and the courſe of his bowl is determined partly by the conſtitutional bias of the bowl, and partly by the direction communicated in the moment of bowling. This conſtitutional bias is given to the bowl by a certain quantity of lead, and its indirect, curvilineal propenſity is greater, and conſequently more difficult to counteract, in proportion to the quantity

quantity of metal in its compoſition. But a bias may be given by other metals: gold is yet heavier than lead, and a natural levity in the wood, will give equal effect to a leſs quantity of either. A ſtudent may be biaſed by too much lead, by too much gold, or negatively biaſed by too much levity. But, to continue the ſimile, are we therefore to conclude, that a ſkilful bowler has it not in his power to give his bowl the true direction to the goal. Would not ſuch an artiſt laugh at the Predeſtinarian who ſhould endeavour to convince him that he was not, in this inſtance, a free agent, and that his ſucceſs did not depend entirely on his free will and dexterity.

Hence, I think, we may rationally conclude, that every effect is the natural conſequence of a ſufficient cauſe, and, to ſpeak in the language of mathematicians, that the fortunes of men are *generally* in a direct ratio of their prudence and abilities.

Without abilities to a certain degree, and alſo without a certain quantum of ſchool learning, it is impoſſible for a young man to cut any figure at the Univerſity; but the moſt diſtinguiſhed abilities, with all the claſſical learning that a ſchoolboy can poſſibly

bly acquire, are not of themſelves ſufficient to lift a young gentleman to that degree of notice, to which, a truly liberal mind will naturally aſpire. His parts, his learning, without prudence are of little value. Like a ſhip without balaſt, he becomes the ſport of every wind, and is in perpetual danger of deſtruction.

Remember what I am now going to ſay. I mean to ſpeak very emphatically, becauſe it is the hinge on which your future fortunes will turn. I mean *your choice of companions*. It is a matter of infinite importance. Young men, on their firſt arrival at the Univerſity, naturally look up to thoſe who have been ſome time matriculated; they liſten to their information with complacency, and too implicitly imbibe their opinions of men and things. "Such a Profeſſor is a ſtupid fellow—ſuch a tutor is a tedious blockhead—ſuch a duty is a *bore*." This is a language which you will frequently hear. But you will very ſoon diſcover, that theſe orators are generally indolent, illiterate, weak young men; totally inſenſible to that thirſt of knowledge, that noble enthuſiaſm, that glorious ambition with which the great luminaries of ſcience were inſpired, and without

out which, all expectations of pre-eminence are vain.

Moroſeneſs in a young man is unamiable and unnatural; but there is a certain degree of reſerve neceſſary on his firſt admiſſion into a numerous ſociety. Intimate connexions are more eaſily avoided than broken. I do not wiſh by this caution to taint your mind with ſuſpicion; but remember, that *evil communications corrupt good manners*, and that in friendſhip with a vicious character, you are conſtantly walking on the brink of a precipice. How confident ſoever you may be of your own ſafety, the moment he ſlips, he will certainly lay hold of your gown, and down you tumble headlong together.

I am very ſorry to hear that in the Univerſities

Sunt qui nec veteris pocula Maſſici
Nec partem ſolido demere de die
Spernunt.

Fortunately, in this kingdom, drinking is rather an expenſive vice, and therefore neceſſarily confined to a part of the community. It cannot much interrupt the ſtudies of thoſe, who come to the Univerſity, merely with

with an intention of whiling away a few years which they knew not how otherwiſe to employ. But theſe young noblemen and gentlemen, will ſoon be too fatally convinced, that early drinking will infallibly deſtroy their conſtitutions, impair their intellects, and ſhorten their lives. I ſpeak as a phyſician: if there be a power on Earth, whoſe intereſt it is, gradually to annihilate the ſtrength and political importance of this nation, no means could be deviſed half ſo effectual, as that of alluring the ſons of noblemen and gentlemen of rank and fortune, to premature debauchery.

You are not hence to conclude, that Nature gradually ripens men for vice. Vice is at all times, and in every ſtage of our exiſtence, a moſt induſtrious enemy to health, and conſequently to life; but at any age, before the body has attained its *acme*, every ſpecies of debauchery is doubly deſtructive: and, were it even poſſible that an herculean conſtitution ſhould, in time, recover the effect of juvenile imprudence, the reſolution neceſſary to conquer vicious habits is ſo rarely found, that early debauchery generally ends in premature imbecility, and decrepitude both of body and mind.

But

But the vice of *drinking to excefs*, muft not be imputed excluſively to the Univerſities. Its ſource lies frequently ſomewhat higher. I am ſorry to ſay, that this inſidious enemy to human nature, often originates in our public ſchools. Shame to tell! the preſent age affords many examples of drunken ſchoolboys. What can be the cauſe of an evil ſo enormous? Who are we to cenſure? —The maſters?—No. They do every thing in their power to prevent it; but in vain. It originates in the inconceivable folly of opulent parents, who, by ſending their darling ſons, after every vacation, with guineas in their pockets, furniſh them with the temptations to every kind of irregularity. Not only drunkenneſs is the conſequence of this oſtentatious parental weakneſs, but other vices that are often ſeverely felt in the third and fourth generation.

Many young gentlemen ſail down the tide of indulgence for want of capacity, or reflexion, to perceive the rocks and quick-ſands, amongſt which their voyage muſt terminate. Theſe deſerve our compaſſion. But, what ſhall we ſay of thoſe, on whom nature has beſtowed penetration and foreſight, amply ſufficient to know the conſe-

quences of vice and folly? Such young men are impelled by the pride of wealth, which enables them to be irregular; or by the pride of daring to be vicious; or by example; or by evil habits contracted at Eton or Weſtminſter. Both theſe are noble inſtitutions; they are upon the whole well regulated; but the beſt regulations and the moſt ſevere attention of the maſters, will never prevent juvenile debauchery, ſo long as parents are ſo fooliſh as to furniſh their children with the means.

We expect you to dinner to morrow. By obſerving the following directions, you may avoid the extreme dirt of our village.

TO Trumpington tramping to viſit the Doctor,
Which ſure you may do without dread of a Proctor,
The village when juſt you begin to approach,
Before you arrive at the *Horſes and Coach*,
Lo! a path on your right—to gain which, without fail
Clap your hand on the poſt and ſkip over the rail.
Then follow your noſe 'till you come to the church,
And thus you will leave all the mud in the lurch.
You now muſt proceed to the ſouth of that ſteeple
Whoſe five brazen tongues call, in vain, the deaf people.

Behold,

Behold, on your left, a white gate—once ſublime!
But all human grandeur muſt yield to old Time.
That gate thro' which Anſtey, when ſeiz'd with devotion,
Forth iſſued—tho' that was not oft, I've a notion.
Perhaps for the chirping of birds he'd no reliſh:
'Tis not heavenly muſic, 'tis true—rather helliſh.
I muſt tell the truth, if I forfeit my neck for't,
The ſparrows are often much louder than Heckford.
If I were the parſon, for ſake of the fun,
I'd ſhoot all theſe birds, if I borrow'd a gun.
Perhaps that might claſh with the Canons, or Rubrick,
Or of glaſs it might coſt ſome new pains, or a new brick.
No matter; the pariſh muſt pay, to a farthing,
Repairs of the Church, in Accounts of Churchwarding.
Now enter the gate, and now put off your ſhoes,
For 'tis all holy ground, 't was the ſeat of that Muſe,
That whilom the Trumpington Bard did inſpire:
Here he ſung the *Bath Guide*—Here ſhe tun'd his ſweet lyre:
That poem delightful to youth and to ſages
Of this preſent age, and of all future ages.
Alas! of that Bard's rich poetical treaſure,
Here nothing remains, but of verſe the ſame meaſure.

So

So coiners of braſs, of the die in poſſeſſion,
To ſixpences give but external impreſſion.
No matter: tho' this may not prove current coin,
You'll find on the table an honeſt Sir Loin.
The time you remember, for Time's on the wing:
We wait not a moment paſt *three*, for the King.

Adieu!

LETTER IX.

YOU will hardly find yourſelf ſettled in your cell, before you will be informed by ſome of your fellow Students, that you are to read Logick; a Science of which you cannot have formed any idea. It is derived from Λογος, *ſermo*, *verbum*, and was at firſt conſidered as the art of converſing or rather diſputing. Zeno, a Greek philoſopher, who lived about 450 years before Chriſt, is ſaid to have been the inventor of this art, if an art it may be called. It was afterwards particularly cultivated by the Greek ſect of of philoſophers, called the *Peripatetics*, of whom Ariſtotle was the chief.

When you are better acquainted with the hiſtory of literature, you will learn, that, after the deſtruction of the Roman empire, many ages elapſed before the revival of any art or ſcience. You will alſo learn, that, after this revival, the writings of Ariſtotle became the Goſpel of Philoſophy, and that his books were claſſical in every part of Europe till the beginning of the laſt century. About that time *Des Cartes*, publiſhed a new

new ſyſtem of Philoſophy, different, but not leſs chimerical, than that of Ariſtotle. It prevailed, however, particularly in France, until our immortal Newton publiſhed his *Principia*; which, being founded on facts, neceſſarily refuted all former hypothetical opinions.

The philoſophy of Ariſtotle, and of *Des Cartes*, is now totally diſregarded and forgotten: yet the Logick of the preſent day is fundamentally that of Ariſtotle, whoſe ſyſtem *Des Cartes* new-modelled and corrected. He divided his book into four parts, viz. *De mentis perceptione—De judicio ſeu propoſitione—De ratiocinatione ſeu ſyllogiſmo—De methodo ſeu diſpoſitione.* This diviſion has been generally adopted by ſubſequent writers on this ſubject. Le Clerc, however, one of the beſt of them, entitles his four diviſions, *De ideis—De judiciis—De methodo—De argumentatione.*

Ariſtotle, and his diſciples, divided the objects of thought or *entia*, into ten claſſes, *categoria*, or *prædicamenta*; all which, except the firſt, they called Accidents. Theſe are they: *Subſtantia, Quantitatis, Qualitatis, Relationis, Actionis, Paſſionis, Ubi, Quand, Situs, Habitus.*

On theſe principles, the Ariſtotelian Logicians diſputed with great ſubtilty, and to very little purpoſe, in every Univerſity in Europe, till about the year 1630, when Des Cartes publiſhed his Philoſophy, which, in a little time, roſe into reputation on the ruins of Ariſtotle.

A great variety of books on Logick, tranſlated or tranſcribed from Ariſtotle and Des Cartes, were written and publiſhed in the laſt century. Of the preſent century I recollect no book of any note on this ſubject, except *Watts* and *Duncan*, both in our own language. The laſt of theſe, I underſtand, is the book now generally recommended by the Tutors at Cambridge, to be read by ſtudents of the firſt year. It has ſome merit in point of arrangement; but it wants perſpicuity; it contains many unneceſſary repetitions, and is frequently inaccurate even in point of grammar. Why this art, which in our Univerſities is never publickly exerciſed but in Latin, ſhould be ſtudied in Engliſh, I cannot underſtand. Perhaps you will aſk, to what purpoſe is it ſtudied at all?

We muſt not be too ready with our *cui bono?* The Logick of the *Peripatetics*, I confeſs, is little better than a uſeleſs jargon; and

and even the beſt ſyſtem of Logick, conſidered only as the art or inſtrument of diſputation, is more likely to confound truth than diſcover it. A public logical diſputation reſembles much the practice, in former times, of ſeeking truth by ſingle combat. He that was moſt dexterous in the uſe of his weapons, whether a true or a falſe Knight, always proved victorious. Logick, I think, might as well have marched into oblivion with Knight-errantry, Juſts and Tournaments. Nevertheleſs, if I diveſt Logick of its Ariſtotelian jargon; if I call it the art of *thinking*, not of *wrangling*; or rather, if I call it not an *art* but a *ſcience*, the knowledge of myſelf, of the origin and progreſs of my own ideas; a ſyſtem of Logick will then appear a delineation, a chart of the human underſtanding, and conſequently an object highly deſerving my attention.

But ſuppoſe it to be of no uſe as an inſtrument of inveſtigation, it is univerſally conſidered as a branch of Academical learning; no young gentleman therefore would run the riſk of appearing ignorant of Logick as an art, its terms, and conſtruction. Beſides, as the Univerſities chuſe to make it

the ladder to honours, it would be fooliſh to kick it down till you have done with it.

The following Outline of this Art of Reaſoning will give you a general idea of the ſubject; without which, you would read your *Duncan* the firſt time over, almoſt entirely in the dark. I have thrown the whole into four tables; which, being compared with the book as you proceed, will conſiderably aſſiſt your memory.

TABLE

TABLE I. LOGICK.

- Logick
  - Perception
    - Ideas, whence
    - Ideas simple
    - Ideas of substances
    - Ideas of the mind
      - Ideas compound
      - Ideas abstract
      - Ideas of relations
    - Ideas, words the signs of
    - Definition
    - Composition and resolution
  - Judgment
    - Judgment, grounds of
    - Propositions, affirmat. and negat.
    - Prop. particular and universal
    - Prop. absolute and conditional
    - Prop. simple and compound
    - Prop. selfevident and demonstrat.
  - Reasoning
    - In general, and its parts
    - Its object; to determine gen. & species
    - Regarding powers and properties
    - Forms of Syllogisms
    - Demonstration
  - Method
    - In general
      - Analytic, tracing things backward to their source.
      - Synthetic, deducing things from their first principles.
    - Of Science, is that certain knowledge which we derive from the contemplation of our own Ideas, deduced from intuitive propositions.

TABLE II. PERCEPTION.

- Ideas, original from
  - Senſation, as of Light, Darkneſs, Heat, Cold, &c.
  - or Reflexion, as of Thinking, Doubting, Believing.
- Ideas, ſimple from
  - Senſation, as Qualities, viz. Sound, Colour, Smell.
  - or Reflexion, as Perception, Volition, &c.
  - or from both: as Ideas of Pleaſure, Pain, Power, Unity.
- Ideas of Subſtances.
  - Material. The union of Properties or Qualities, viz. Gold, Water, Man. Qualities or Modes are Eſſential or Accidental.
  - or Immaterial, called Spirit.
- Ideas, framed by the Mind.
  - Compound, when many ſimple Ideas are united, as in Beauty, Gratitude, Harmony, an Inch, a Mile, a Square, a Circle.
  - Abſtract: i. e. when ſeparated from the circumſtances that render the Idea particular: it becomes general, viz. a □, a ○, &c.
  - Relative, or Comparative, as Greater, Leſs, Older, Father, Son, &c.

Ideas, words the ſigns of. But ſimple Ideas not being definable — as, White, Red — words are capable of communicating complex Ideas only, unleſs the ſimple Ideas exiſted already in the mind of the perſon with whom we converſe; but complex Ideas may be defined, as *Animal*, *Rational*, &c.

Definition: explains the meaning of words that ſtand for complex Ideas. — Definition of the Names of things is arbitrary and admits of no diſpute: but, of the thing, is capable of proof and may therefore be doubted. Definitions are deſcriptions of Ideas in the mind.

Compoſition and Reſolution of our Ideas. In definitions we ſhould begin with Claſs, thence deſcend to Orders, thence to Genera, thence to Species, thence to Individuals.

TABLE III. JUDGMENT.

- Judgment from
  - Intuition: the immediate perception of the agreement or disagreement of any two Ideas: *The whole is greater than any of its parts.* The foundation of Scientific Knowledge.
  - Experience: the foundation of Natural Knowledge.
  - Testimony: the foundation of History.
- Propositions are Judgments put into words, affirming two or more Ideas to agree or disagree. They consist of Subject = *God*, Copula = *is*, Predicate = *omnipotent.* If a negative particle be added to the Copula, the Subject and Predicate are disjoined: it is then called a negative Pred.
- Propositions
  - Universal; the signs of which are *all, every, none, no. All men are mortal.* Here the Predicate applies to every individual of the Subject.
  - Particular; the signs of which are *some, a few, a part. Some Students are blockheads.* Here fortunately the Predicate applies but to part of the Subject.
- Propositions
  - Absolute: *God is infinitely wise.*
  - Conditional: *If a Stone be exposed to the Sun, it will contract heat.* Here the Predicate is not necessarily connected with the Subject.
- Propositions
  - Simple, have one Subject and one Predicate: *God is just.*
  - Compound
    - have 2 Subjects and 1 Predicate: *God is wise and powerful* —— or 1 Subject and 2 Predicates: *Kings are neither exempt from Pain nor Death* —— or 2 Subjects and 2 Predicates: *Riches and Honours elate the Mind and increase our Desires.*
- Propositions
  - Selfevident: *It is impossible for the same thing to be and not to be.* Speculative Propositions are Mathematical *Axioms:* Practical Propositions are *Postulata.*
  - Demonstrative: *The World had a beginning.* Speculative, 47th of the 1st book of Euclid. Practical, to describe a square on a given right line.

TABLE IV. REASONING.

Reaſoning in general is an operation of the mind deducing ſome unknown Propoſitions, from others that are known. Theſe previous Propoſitions, which are called the *Major* and *Minor* of a Syllogiſm, are, in a ſimple act of Reaſoning, two in number, and muſt be intuitive truths.

Major: *Every creature poſſeſſed of reaſon and liberty is accountable for his actions.*

Minor: *Man is a creature poſſeſſed of reaſon and liberty.*

Reaſoning, its object. To rank things under univerſal Ideas, called *genera*; and to ſeparate theſe into *ſpecies*.

Killing is the genus of which *Murder* and *Manſlaughter* are ſpecies.

Reaſoning, regarding powers and properties of things, and the relations of our general Ideas. The object of reaſoning is to diſcover and aſcribe to things their attributes and properties, by a ſkilful application of intermediate Ideas. To do this requires ſome general knowledge and particularly mathematical knowledge.

Syllogiſms, have 4 figures
1. Middle term Subject of the Major and Predicate of the Minor.
2. Middle term the Predicate of both.
3. Middle term the Subject of both.
4. Middle term Predicate of Major and Subject of the Minor.

Moods of Syllogiſms
- Quantity: Univerſal, Particular
- Quality: Affirmative, Negative.

Syllogiſms hypothetical or conditional: the Major always conſiſts of Antecedent and Conſequent, the firſt implying the latter.

Modus ponens, admits the Antecedent in the Minor.

Modus tollens: the Minor rejects the Conſequent.

Enthymemes: when one of the Propoſitions is not expreſſed.

TABLE IV. continued.

Reasoning by

- Series, in which the Predicate of one simple Syllogism becomes the Subject of the next, and so on, till the Subject of the first, and Predicate of the last unite in the conclusion.
- Induction affirms of the whole what is true of all its parts: thus — *Quadrupeds move, Birds move, Fishes move, Insects move, ergo all Animals move.*
- Dilemma proves the absurdity of an assertion. If the Major be affirmative, the conclusion will be negative, and vice versa: so Euclid proves two figures to be equal, by shewing the absurdity of supposing them greater or less.

Demonstration is a Series of Syllogisms whose premises are either definitions, selfevident truths, or propositions already established. Demonstration is *Direct* or *Indirect*.

LET-

LETTER X.

THAT during your reſidence at the Charter Houſe, you have forgotten all you knew of Arithmetic before your admition, is no great wonder; nor is it any great misfortune. Arithmetic, (derived, you know, from ἀριθμὸς and μέτρον) is a Science which ſchool boys learn only as a mechanical art: they are taught, by certain rules, to pile up numbers and pull them down again, as, by way of amuſement, they would the *men* of a Backgammon-table, without the leaſt comprehenſion of the reaſon for the rule, the powers of the numbers with which they work, or the nature of the operation. But when Arithmetic is firſt propoſed, as a new Science, to a young man capable of reflexion, he contemplates its appearance with the ſame inquiſitive eye, the ſame curioſity, the ſame deſire of information, that he would behold a ſtranger poſſeſſing powers that could reach to the very gates of infinity.

Such a Student will probably reaſon thus. "Here are ten ſymbolical characters, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0; with which, when I am

am acquainted with their uſe, I ſhall not only ſignify diſtinctly the greateſt imaginable numbers; but ſhall alſo be able by an artful poſition and dexterous uſe of them, to anſwer the moſt difficult queſtions in which numbers are concerned. The enlightened Greeks and Romans knew nothing of theſe ten magical figures: they were, it ſeems, invented by the Arabians. It appears to have been an invention infinitely ingenious and important, and I now ardently wiſh for a philoſophical acquaintance with theſe inſtruments."

The firſt ſingularity which you will obſerve in theſe Arabian figures, is that, when any number of them ſucceed each other, we eſtimate them, as we read the Hebrew language, from right to left, thus, 796. The firſt figure on the right hand is *ſix units*; the ſecond, *nine tens*; the third, *ſeven hundreds*. If to theſe three figures I add three more, thus 428,796, they alſo expreſs, like the firſt three, units, tens, hundreds; the 8 is eight thouſand units, the 2 is twice ten thouſand or twenty thouſand units, and the 4 is four hundred thouſand units. If to theſe I add a ſeventh figure, it will expreſs ſo many millions of units, an eighth figure

ſo

ſo many tens of millions of units, and ſo on: thus you perceive all numeration, be the ſum ever ſo great, is no more than a repetition of the denominations of the three firſt figures.

Theſe obſervations may appear trivial. Euclid's Geometry is built on ſelf-evident propoſitions, which, to a learner, always ſeem trifling. It is impoſſible to begin the ſtudy of any Science too near its ſource.

We now proceed to the firſt and moſt ſimple operation of Arithmetic called *Addition:* for example

To 25, the quarter of a hundred
Add 75, three quarters of a hundred

Sum 100

I reaſon thus, 5 and 5 make 10; but I cannot put down ten in the unite's place, therefore I carry in my mind, this ten to the 7, which ſtands in the ten's place; thus the 7 becomes an 8, and this 8 added to the 2, makes ten tens. Now ten tens make one hundred; therefore I write a cypher in the ten's place and a *one* in that of hundreds: for, as I have but ten figures to work with, and as each of theſe expreſſes units only, I can put down, after each addition, no more

than the number of units leſs than ten. The number of tens evidently belongs to the next column on the left hand; for, ſuppoſe I am adding the ſecond column from the right, though I do nothing more than add units together, yet, occupying the ſecond place, they are tens. In like manner, every ten in the third column is ten hundred, and muſt therefore be carried to the fourth column, the column of thouſands, and ſo on.

Thus far we are carried along by the ſtream, without the leaſt trouble. Let us now conſider the 25 and 75 as fractional parts of 100. In plainer terms, let us ſuppoſe a rod of any length you pleaſe, broken into a hundred pieces; theſe pieces are properly called broken, or fractional, parts of a hundred. But 25 being one fourth part of 100, and 75 being three quarters of 100, they might be thus written $\frac{1}{4}$ and $\frac{3}{4}$. How are theſe two fractions to be added ſo as to make a hundred? — The figure above the line is called the *numerator*, becauſe it indicates the number of parts, and the figure below the line is called the *denominator*, becauſe it denominates the kind of parts. In theſe two fractions they are both of the ſame denomination, both fourths: therefore, in the

the preſent caſe, I have nothing to do but to add the two numerators together for a new numerator, and ſubſcribe the common denominator: the fraction will then ſtand thus $\frac{4}{4}$, that is, four fourths, equal to one whole: four fourths of a hundred make a hundred.

But ſuppoſe the fractions were $\frac{1}{4}$ and $\frac{6}{8}$, I cannot add them together until I have brought them to the ſame denomination: that is, until their denominators are alike; eighths and fourths cannot be accumulated in one homogeneous ſum. I conſider that in multiplying ſeparately any two figures by any one other figure, I neither increaſe nor diminiſh their relative value; for, if I double, that is, if I multiply by 2, the two figures which I will ſuppoſe to ſignify the half of a ſhilling, viz. $\frac{1}{2}$, the 1 becomes a 2 and the 2 a 4, thus $\frac{2}{4}$. Now one half of a ſhilling is ſix pence, and two fourths are twice three pence:—hence, I firſt quadruple, that is, multiply the two figures of the ſecond fraction by 4, the denominator of the firſt, and the product is $\frac{24}{32}$. I then multiply both the figures of the firſt fraction by 8, the denominator of the ſecond, and find the product $\frac{8}{32}$. Thus I have brought them to one denomination;

nation; ſo that I can now add the numerators 24 and 8: the ſum is 32 for a new numerator: my fraction therefore thus added is $\frac{32}{32}$ equal to one whole, or one hundred: for all the parts of any thing muſt be equal to the whole. This may be made ſtill plainer, thus. Without any knowledge of Euclid, or of Arithmetic, a moment's reflexion convinces me, that, if I take equal quantities from any two numbers, their proportion to each other will remain the ſame: ſo that if I take half from the $\frac{32}{32}$ there will remain $\frac{16}{16}$. If I then take half from each of theſe ſixteens, there will remain $\frac{8}{8}$. One ſtep farther brings the fraction to $\frac{4}{4}$; the next ſtep to $\frac{2}{2}$ and the laſt to $\frac{1}{1}$, which is evidently the ſame as *one* a whole number; for one ones is one.

Let us now conſider, whether it be not poſſible to manage this 25, the quarter, and this 75, the three quarters, of a hundred, without being troubled with theſe denominators beneath the line? You know I firſt wrote them thus $\frac{1}{4}$ and $\frac{3}{4}$. But if for the 1 I ſubſtitute 25, and for the three I take 75, I muſt then write $\frac{25}{100}$ and $\frac{75}{100}$. You remember, that theſe denominators, theſe under figures, indicate the ſpecies of parts:

 they

they tell us, in the preſent caſe, that the 25 and 75 are parts of a hundred. Knowing therefore what they are, I can add them, ſubtract them one from the other, or work with them in any manner I pleaſe, juſt as I would with whole numbers. But before I diſcover to you what I am about, another previous ſtep is neceſſary.

Imagine that I have before me the fraction $\frac{1}{2}$. I want to expreſs its value by a ſingle figure, without this troubleſome denominator. I know that I can multiply theſe two figures ſeparately by any other figure without altering their value, thus multiplying them by 5, the 1 becomes a 5 and the 2 a 10: the fraction therefore is now $\frac{5}{10}$ or $\frac{50}{100}$ or $\frac{500}{1000}$. I now perceive that I have no farther occaſion for theſe denominators; that in theſe Decimal Fractions *one* figure denotes tenths, *two* figures hundredths, *three* figures thouſandths: thus ,4 with a comma before it, ſignifies four parts of ten; ,37 means thirty ſeven parts of a hundred; ,365, are three hundred and ſixty five parts of a thouſand. This being perfectly underſtood, I can add theſe Decimals in the ſame manner as whole numbers. For example,

To

To ,74. I proceed as in common Addition. Add ,39

The ſum is 113. What is this ſum? Why it is a 113 hundredth parts; for, there being only two figures in either of the Decimals, it is evident, that when added together, the ſum muſt neceſſarily conſiſt of hundredths. But 113 hundredth parts make one entire hundred and 13 fractional parts of another hundred. The 1 therefore on the left hand ceaſes to be a fraction: it becomes what Arithmeticians call an Integer; that is, a whole number: ſo that I muſt point it thus 1,13. Hence the rule that in the addition of Decimals *you muſt point off as many figures as there are figures in either of the numbers to be added.*

This rule you will find in all books of Arithmetic; but the authors of theſe books never give any reaſon for the rule; it becomes therefore a mere matter of memory and is ſoon forgotten.

The ten figures uſed in vulgar and decimal Arithmetic are doubtleſs wonderful inſtruments for the purpoſe of calculation. Let us try however whether it be not poſſible to find other ſymbols, which, by ſigni-

fying any ſum at pleaſure, may render calculation leſs laborious.

Suppoſe, for example, the letter *b* repreſents 750l. If I have two creditors, each of which owe me exactly this ſum, and I want to know the whole amount, according to the rules of addition in common Arithmetic, I proceed in this manner 750

750

1500. But ſuppoſing the letter *b* to repreſent 750l. I then place the two ſymbols under each other, thus

To *b*
Add *b*

The ſum is 2*b*, equal to 1500l.

This Science, in which letters are uſed inſtead of figures, is called *Algebra*, a word derived from the Arabic *al-giabr wolmokabala*, ſignifying, *the art of reſolution and equation*. It is ſuppoſed to have been invented in India, and that the Arabs received it from the Perſians. It is certain however that it was brought into Europe by the Moors, who conquered Spain in the 8th century. The firſt printed book in Algebra was written by

by Lucas de Burgo, and publiſhed at Venice, in the year 1494. You will be infinitely pleaſed and aſtoniſhed at the power of this Science, when you become perfectly acquainted with its uſe. I am in this letter, ſpeaking only of the various modes of Addition, viz. of figures as ſymbols of whole numbers, of vulgar fractions, of decimal fractions, and of letters as ſymbols of number or quantity.

But, before we proceed with the addition of theſe Algebraic quantities, I muſt tell you, that Algebraiſts ſuppoſe every quantity, or letter, to be either *poſitive*, of which this + is their ſign; or negative, which they mark thus —. The firſt they read *plus*, the other *minus*. You muſt alſo remember, that when there is no ſign prefixed, *plus* is always underſtood, and that when there is no figure before the letter or quantity, the figure 1 is ſuppoſed.

(1)	(2)	(3)	(4)
To $3a$	To $-b$	To $-9x$	To $+7y$
Add a	Add $-2b$	Add $+12x$	Add $-9y$
Sum $4a$	$-3b$	$+3x$	$-2y$

(5)

To $2c+3b-7x$
Add $4z-6y+b$

Sum $2c+3b-7x+4z-6y+b$

The truth of the firſt example is very obvious. Suppoſe a to repreſent any poſitive quantity, once a added to three times a muſt make four times a.

In the ſecond example, the quantities are both negative: they repreſent a want or deficiency. Now a want of one ſhilling added to a want of 2 ſhillings, amounts to a want of 3 ſhillings, or $-3b$.

But in example the third, the ſigns are different. How is it poſſible to add a poſitive to a negative quantity? It is impoſſible; but it is very evident, that by taking one out of the other; that is, by ſubtracting the leſs from the greater, I ſhall diſcover the amount: for, if I have 12 ſhillings in my pocket, and owe you 9, which 9 is, to me, a negative quantity, I have yet a poſitive 3 ſhillings remaining; therefore the amount of my ſtock and debt taken together, may be properly expreſſed by $+3x$. This, I confeſs, is a ſpecies of Iriſh Addition, performed by Subtraction: it is, nevertheleſs, con-

conſidered as an operation of Addition in all the books of Algebra.

In the fourth example the ſigns are again diſſimilar; but here the negative ſum exceeds the poſitive. No matter: I ſubtract the leſs from the greater, as in the former example, and to the remainder 2, I prefix the ſign of *minus*; for, if I owe you 9 ſhillings and can pay you only 7, there is a deficiency of 2, properly expreſſed by $-2y$.

In contemplating the fifth example, I immediately perceive, that there are no two quantities alike; and, as I am ignorant what theſe ſeveral letters, or quantities, may ſignify, it is impoſſible to add them by any other means, than by writing them down in ſucceſſion with their reſpective ſigns, as in the under-written ſum.

If you take the trouble to read this letter a ſecond time, with any degree of attention, you will not only comprehend the nature of Addition of whole numbers, vulgar and decimal fractions and of Algebraic quantities; but you will have acquired a general idea of theſe ſeveral modes of computation. This general idea will conſiderably facilitate your progreſs in mathematical learning.

LETTER XI.

IN my laſt letter, I endeavoured to give you a clear idea of the ſeveral contrivances for the addition, or accumulation, of numbers or quantities. They are all founded on the ſame principle; their object is the ſame, and, being thus linked together, mutually illuſtrating each other, ſeem moſt likely to impreſs the mind ſcientifically. I ſhall now proceed to SUBTRACTION, the *rationale* of which you will eaſily comprehend. The deſign of this operation is, by taking a leſs number from a greater, to diſcover the difference. For example,

From 769
Take 436

Sum 333

Beginning with the firſt figure on the right, I ſay 6 from 9 there remains 3; then 3 from 6, there remains 3; and laſtly, 4 from 7 and the remainder is 3. To prove that I am right, I add the *ſum* to the leſs of the two numbers above, and find, that together, they make 769.

Again;

Again: From 9312
Take 7434
Sum 1878

If you were totally ignorant of the firſt rules of Arithmetic, you would not immediately diſcover by what means 4 could be ſubtracted from 2, or 3 from 1, or again 4 from 3. But, if in your mind, you take ten from the next figure and add it to the 2, you can then ſubtract the 4 from 12 and the remainder will be 8.—You now proceed to the next figure 3, which you are to ſubtract from the 1 above it, but as you have already taken 10 from this 1, which ſtanding in the ten's place is one ten, it becomes a 0; therefore you are to ſubtract 3 from 0: this being impoſſible, you again take ten from the next figure and ſubtracting 3 from ten, you put down 7. You are now to take 4 from the 3 above; but this 3 is, in fact, only 2, for the ſame reaſon that the 1 became a 0; 4 cannot be ſubtracted from 2; I therefore take ten from the 9000, and ſay 4 from 12, there remains 8. But you are to obſerve, though I call it taking *ten* from the next figure, that, when from the 3 I took 10, in fact I took 100; properly

ſpeak-

ſpeaking, therefore, I ſhould have ſaid, 30 from 0 is impoſſible; but 30 from 100, there remains 70. In like manner, the 10 which I took from the 9, was in reality 1000: ſo that in taking 4 from 12, I was really ſubtracting 400 from 1200.—You now proceed to the 7, and, recollecting that one of the thouſands was uſed among the hundreds, you ſay 7 from 8, or rather 7000 from 8000, there remains 1000.

You will probably think that I have been unneceſſarily minute in a matter of little importance. Nothing is unimportant that may throw a ſingle ray of light on the threſhold of Science. I am thus explicit on the *Subtraction* of whole numbers, becauſe the manner in which it is taught in our ſchools, ſeems particularly deſigned to prevent the boys from conceiving any more than a mechanical idea of the operation: or, if they have any other idea at all, it is certainly falſe. They are inſtructed to borrow *ten* from the next figure in the upper line, which ten they afterwards call *one* and reſtore it to the next figure in the under line. Now, though the reſult be the ſame, whether I increaſe the lower, or diminiſh the upper line, by *one*, why miſlead the learner

learner by a falſe operation? why uſe the improper term *borrow*? It implies the neceſſity of reſtoration. But, in fact, there is nothing borrowed, and conſequently nothing to be reſtored. What is taken from the next figure, is taken abſolutely and uſed: it has already, prematurely, yielded its ſubtractive part, and therefore is not liable to a ſecond diminution: The figure from which it was taken, if it ſtand in the 2d place from the right, has loſt ten of its value; if in the 3d it has loſt a 100: ſo that if the figure be a 7, I conſider it as a 6, and act accordingly.

I now proceed to give you a general notion of ſubtracting *fractional* numbers from each other. If, for example, you were required to take $\frac{1}{4}$ from $\frac{3}{4}$, it is very evident that the remainder will be $\frac{2}{4}$, or $\frac{1}{2}$: ſo that when the denominators are the ſame, you have nothing to do, but to ſubtract the leſs numerator from the greater.

If the denominators be not the ſame, reduce them to fractions of the ſame denomination, by multiplying each numerator into the other's denominator for two new numerators, and the denominators by each other, for a common denominator; then proceed

as

as in the laſt example, thus: Suppoſe the two fractions to be $\frac{7}{8}$ and $\frac{3}{5}$; reduced to the ſame denomination, they become $\frac{35}{40}$ and $\frac{24}{40}$; the numerators of which being ſubtracted from each other, the remaining fraction is $\frac{11}{40}$.

You remember that, in theſe vulgar fractions, the under figure tells you the parts into which the upper figure is ſuppoſed to be divided, and the upper figure indicates the number of theſe parts: the denominator therefore is conſidered as the *deviſor* and the numerator as the *dividend*. But you will aſk, how can a leſs number be divided by a greater, a 7 by 8, or 3 by 5, or 1 by 2? —Would you find any difficulty in cutting this orange in two? No—Well: What are theſe two pieces?—They are two halves. Then it is evident that 1 orange may be divided into, or by, 2, and that $\frac{1}{2}$ would expreſs one of theſe halves: to halve a number therefore is to divide it by 2.

But to render this numerator 1 actually diviſible by the denominator 2, let us ſuppoſe it to conſiſt of ten equal parts: we therefore add a cypher to it and call it 10 parts inſtead of 1 whole number. I now write the fraction $\frac{10}{2}$; that is, 10 divided by

2; and, proceeding to divide the numerator by the denominator, by aſking how often 2 in 10 tenths, the anſwer is 5 tenths; which 5 having 10 for its denominator, I call a decimal fraction. So that the way to reduce a vulgar fraction to a decimal, I find, is to add a cypher to the numerator and divide by the denominator. If I had added two cyphers and divided by 2, the product would have been ,50 that is, 50 parts of 100; equal to 5 parts of 10; equal to $\frac{1}{2}$ or 1 divided by 2.

According to this rule, let us reduce $\frac{3}{5}$ to a decimal fraction. Adding one cypher to the 3 it becomes 30, and dividing 30 by 5 the anſwer is 6, that is $\frac{6}{10}$ which being a decimal, I write thus ,6. So the vulgar fraction $\frac{1}{2}$ reduced to a decimal is ,5, and $\frac{3}{5}$ is ,6. This 5 may be ſubtracted from the 6, as in ſubtraction of whole numbers, and the remainder is ,1; that is, one tenth: for as both the 5 and 6 are tenth parts of an unit, the remaining 1 muſt neceſſarily be $\frac{1}{10}$ of an unit.

Let us now conſider the Subtraction of Algebraic quantities. This is the Rule. *Reverſe the ſigns of the quantity to be ſubtracted and proceed as in Addition:* for example,

(1)	(2)	(3)
From $3a$	From $-2b$	From $-12x$
Take a	Take $-b$	Take $9x$
$2a$	$-b$	$-21x$

(4)

From $9y$

Take $-7y$

$16y$

In the firſt and ſecond of theſe examples, the ſigns, in both quantities, are alike: but, if I ſuppoſe the ſign of the ſuſttrahend to be reverſed, they are then oppoſite. Now the rule in Addition is, *when the ſigns are not the ſame, ſubtract the leſs from the greater, and put down the remainder with the ſign of the greater*: hence a from $3a$, and the remainder is $2a$. In like manner $-b$ from $-2b$, there remains $-b$.

In the third and fourth examples, the ſigns are oppoſite; but ſuppoſing the ſigns of the ſubtrahends to be reverſed, they will then become ſimilar to thoſe of the quantities above them: I have therefore nothing to do but to add the figures, (which are called Coefficients,) as in common Arithmetic, prefixing the common ſign of both. Thus

Thus it appears, that Subtraction differs from Addition only in reverſing the ſigns of the ſubtrahend.

This is all very true. Theſe are the rules which you will find in the elementary books of Algebra. But this confounding Subtraction with Addition, ſerves only to jumble the ideas of the learner. The following general rule is ſufficient both for Addition and Subtraction.

In Addition, *when the ſigns are the ſame,* ADD; *when they are oppoſite,* SUBTRACT. In Subtraction, *when the ſigns are the ſame,* SUBTRACT; *when oppoſite,* ADD. This rule being obſerved, you proceed naturally, without any ſuppoſed change of ſigns. The reaſons for the three firſt parts of this Rule are ſelf-evident: the laſt requires explanation. I have ſaid, that, in Subtraction, when the ſigns are oppoſite, that is, when one is + and the other —, you are to add the coefficients. How, you will aſk, will this addition be in reality a ſubtraction. I will firſt prove the fact, and then account for it.

From $10a - 56$	To $10a - 56$
Take -56	Add $+56$
$10a$	$10a$

In

In both caſes you ſee the remainder is the ſame. Suppoſe, by way of illuſtration, after a ballot, I find in the bag 10 white balls and 5 black ones. If I take out the black balls, there will remain 10 white balls in the bag. But if before I take out any of the balls, I put in 5 white ones, and then take out the 5 black balls with the ſame number of white ones to ballance them, there will remain in the bag 10 white balls as before. Or ſuppoſe you were five pounds in my debt, and that you are worth nothing, you are then five pounds worſe than nothing. Your caſh account is — 5 pounds. But if any friend ſhould pay the debt, by thus adding his + five pounds to your —five pounds, he actually ſubtracts your debt: ſo that, in this caſe, addition and ſubtraction are the ſame.

LET-

LETTER XII.

I SUPPOSE you have not forgotten your Multiplication-table. If you have it not quite perfect, ſpend half an hour in giving it a firm eſtabliſhment in your memory; for the leaſt miſtake or heſitation in the mechanical part of multiplication, will leave a bad impreſſion on the mind of your Tutor.

The operation of multiplying one row of figures by another, is eaſily learnt, but not generally underſtood. I will endeavour to explain it by a ſhort example. It is neceſſary however, previouſly to obſerve, that Multiplication and Addition are in reality the ſame: thus,

Add . { 3 / 3 / 3 }

Sum . 9

Multiply 3
by . 3
Product 9

The *modus operandi* in Multiplication is as follows.

Multiply 425
by . 213

1275
425
850

90525

In the above example, beginning with the firſt figure on the right hand, I ſay, in the common language of the ſchool, 3 times 5 is 15, put down 5 and carry 1; 3 times 2 is 6, and 1 that I brought is 7; 3 times 4 is 12, put down 12. I then take the ſecond figure, from the right, of the *multiplier*, and with it multiply all the figures of the *multiplicand* as before, putting down the product in a ſecond line, taking care to place the firſt figure under the ſecond figure of the firſt line. I then proceed in the ſame manner with the third figure of the multiplier, placing the firſt figure of the reſult under the third of the firſt product; as you ſee in the example. The ſeparate reſults of theſe three multiplications being thus arranged beneath each other, I add them together and the ſum is the product of the whole

whole multiplication. This may be all very true: the method of multiplying, of carrying *one* to the next figure, of arranging the ſeveral rows inclining gradually to the left — may be rational, but the reaſon is not very apparent. Let us try to explain the operation and demonſtrate the truth of the reſult.

I am to multiply 425
by 213

Firſt, I ſay, 3 times 5 make .	15
Secondly, 3 times 20 make .	60
Thirdly, 3 times 400 make .	1200
I now begin to work with the figure 1: remembering it is a *ten*,	
I ſay, ten times 5 make . .	50
Then, ten times 20 make . .	200
And ten times 400 make . .	4000
I now multiply with the figure 2, remembering that it is 200: thus	
200 times 5 make . .	1000
Secondly, 200 times 20 make .	4000
Laſtly, 200 times 400 make .	80000
Now theſe added together make .	90525

as before: ſo that the uſual conciſe method of Multiplication is demonſtrably true.

From the foregoing example it is impoſ-

 ſible

ſible not to underſtand the *rationale* of multiplying whole numbers: the multiplication of fractions is equally eaſy and intelligible. For example, Multiply $\frac{2}{3}$ by $\frac{3}{4}$. The rule is, *multiply the numerators for a new numerator and the denominators for a new denominator:* thus—twice 3 are 6, and 3 times 4 are 12: the fraction will be $\frac{6}{12}$ or $\frac{2}{4}$ or $\frac{1}{2}$.

To prove the truth of this operation, we will ſuppoſe theſe fractions to be parts of a ſhilling, or pence. Now, two thirds of a ſhilling are 8 pence, and three fourths of a ſhilling are 9 pence: 8 times 9 make 72 pence; that is $\frac{72}{12}$ or parts of a ſhilling. But recollecting that I can reduce this fraction to one of equal value by dividing the numerator and denominator by the ſame number, I divide them by 6, and then ſubſtitute $\frac{12}{2}$, that is, 12 divided by 2: but to divide a number by 2, is to halve that number; ſo that the reſult is $\frac{1}{2}$ of a ſhilling or 6 pence, the ſame as above.

The Multiplication of Decimals differs not in the leaſt from that of whole numbers, except that, in the product, you are to point off as many figures as there are decimals in the multiplier and multiplicand; thus,

2,97

2,97
3,6
1782
891
10,692

There being two decimals in the multiplicand and one in the multiplier, I point off three decimals in the product.

In the multiplication of Algebraic quantities, you have only to write the letters in a line one after the other; to multiply the coefficients as in common Arithmetic, and, when the signs are similar, to prefix the sign +, when dissimilar —, thus,

Multiply a Multiply $-c$ Multiply $-d$
By b By $-d$ By $+e$
Product ab $+cd$ $-de$

Multiply $12x$ Multiply $x+y$
By $-3y$ By $x+y$
$-36xy$ $xx+xy$
$xy+yy$
$xx+2xy+yy$

This, you will say, is very easy and perfectly clear, as to the manner of working: but

you will not, without a little reflection, discover the reaſon why, when the ſigns of the multiplier and multiplicand, are different, you are always to prefix the negative ſign to the product. I will endeavour to explain this matter.

Poſitive and negative quantities are conſidered as diametrically oppoſite. If from a given point I draw a line to the right, I may call it poſitive; then a line from the ſame point, drawn to the left, may be conſidered as a negative line. Or, if I place a cypher in the middle and continue a line of figures both ways, thus 4321 o 1234, thoſe on the right are *more* than nothing; thoſe on the left I will imagine *leſs*. The firſt may expreſs money which I poſſeſs, the latter, money which I owe. Let us ſuppoſe, for example, that I find, in three different parts of my account-book, a debt of 15l. which I have borrowed of a friend.

I expreſs it thus . . . —15:
and finding it three time repeated, I multiply by . . + 3:
that is, I tripple the debt, and
conſequently the product is . —45.

If, on the contrary, I ſuppoſe this 15 to repre-

repreſent all the guineas in my purſe, I write it thus . . . . +15.
But I owe 3 times 15 guineas; I therefore prefix the negative ſign — 3.
And the product is . . — 45,

as before:

Now ſuppoſing the letter *a* to ſtand for 15 guineas, the real ſtate of my account may be thus algebraically repreſented . . . $a-3a=-30$. That is, I am 30 guineas worſe than nothing. In both caſes the propriety of prefixing the negative ſign is evident, becauſe the product is really a defect. In multiplying a negative quantity, or deficiency, or debt, I am adding it to itſelf as often as there are units in the multiplier. I thus increaſe the debt, but I do not thereby alter its nature: it ſtill remains a debt, and therefore retains its negative ſign. To underſtand the other caſe, viz. when a poſitive quantity is multiplied by a negative, it is neceſſary to recollect, that to multiply my debts, is in fact, to ſubtract from my real ſubſtance; therefore, though I work by multiplication, when the multiplier has the negative ſign, I am actually ſubtracting the multiplicand from reality; that is, reducing

it below nothing, as many times as there are units in the multiplier; therefore the product must necessarily be a negative quantity.

But you will ask, what is the reason that when two negative quantities are multiplied by each other, the product must have a positive sign? The reason is plain: for, if to multiply by a negative quantity be to subtract, then such multiplication is actually subtracting from the Debtor page of my account-book, which has the same effect as if the sum were added to the Creditor side. To subtract *minus* is the same thing as to add *plus*. If I discharge, or take away your debt of a guinea at the fruit-shop, it is certainly equivalent to my giving you a guinea. But before I conclude this introduction to Multiplication — for it is no more than an introduction — it is necessary to observe, that the multiplier, whether it be a positive or a negative quantity, or, whatsoever it may be called, is always nothing more than a number, without any real denomination. A pound cannot be multiplied by a pound, nor a mile by a mile.

LET-

LETTER XIII.

IN this letter I mean to call your attention to the Diviſion of whole numbers, fractions, and of algebraical quantities. As Subtraction is the reverſe of Addition, ſo is Diviſion the reverſe of Multiplication. But we have ſeen that Multiplication is really a compendious Addition, and you will ſoon perceive, that Diviſion is nothing more than a method of determining, how many times a leſs number is contained in, or may be ſubtracted from, a greater; ſo that all the various operations of Arithmetic, are in fact, Additions or Subtractions. For example,

Add	5	Multiply 5	From 7
	5	By 7	Take 5
	5	Product 35	Remains 2
	5		
	5		
	5		
	5		
Sum	35		

5)7(1
5
2

In the fourth of theſe examples, the 5 on the left is called the *diviſor*, the 7 is the *dividend*,

vidend, the 1 is the *quotient*, and the 2, the *remainder*. But that you may ſee the whole operation of Diviſion, we will take an example of more figures.

Divide 7634 by 8. I diſpoſe theſe two numbers thus

```
8)7634(954
  72
  ---
   43
   40
   --
    34
    32
    --
     2.
```

I begin by aſking, how many times 8 is contained in 76? Recollecting that 9 times 8 make 72, I write 9 in the quotient and 72 under 76, which 72 I ſubtract from 76, and drawing a line acroſs, I write under it the remainder 4, to which I bring down the figure 3 from the dividend. I now aſk, how often 8 in 43? 5 times 8 make 40, which being ſubtracted from 43, there remains 3. To this 3 I annex the laſt figure of the dividend. I then aſk, how often 8 in 34? 4 times 8 is 32: I therefore write 4 in the quotient, and ſubtracting 32 from 34, the remainder is 2.

Hence,

Hence, I learn, that from the number 7634, 8 may be ſubtracted 954 times, and there will remain a ſurplus of 2.—What is this 2? It is a fraction. It is $\frac{2}{8}$. But to render this more intelligible, let us ſuppoſe 7634 to be ſo many pounds ſterling bequeathed to be equally divided among 8 Legatees: the quotient tells me, that they are entitled to 954£. each, and $\frac{2}{8}$; that is, two eighths of a pound: this remainder therefore muſt be multiplied by 20 in order to reduce it to ſhillings. The product is 40, which being divided by 8, gives 5: ſo that each Legatee will receive 954£. 5ſ. —

I have ſaid that Diviſion is the reverſe of Multiplication. We will put this aſſertion to the proof by trying to rebuild, by the laſt, what, by the firſt, we have pulled down. If 8 be contained 954 times in 7634, then the firſt of theſe two numbers multiplied by 8, with the addition of the remainder 2, muſt pruduce the laſt.

Multiply		954
By	.	8
		7632
Add	.	2
		7634

This

This product proves, not only that Multiplication and Diviſion are the reverſe of each other; but that the Quotient was juſt.

According to the plan I have obſerved in Addition, Subtraction, and Multiplication, we now proceed to the Diviſion of Vulgar Fractions. Firſt, let us try to divide a fraction by a whole number.

Divide $\frac{6}{7}$ by 3. Now a moment's reflection tells me, that I have nothing to do with the denominator, which is put not to indicate the *number* but the *kind* of parts: therefore I muſt divide the numerator 6 by 3 and the quotient will be $\frac{2}{7}$. We will, by way of illuſtration, ſuppoſe this denominator to indicate parts of a guinea. Now, 7 times 3 is 21; therefore, one ſeventh of a guinea is 3 ſhillings: 6 times 3 make 18; therefore $\frac{6}{7}$ of a guinea are 18 ſhillings, that is, $\frac{18}{21}$. I now aſk, how often 3 ſhillings in 18. The anſwer is 6 ſhillings or $\frac{2}{7}$ of a guinea.

Let us now try to divide a fraction by a fraction.

For example, Divide $\frac{7}{5}$ by $\frac{2}{3}$.

This is the rule: *Multiply the Numerator of the Dividend by the Denominator of the Diviſor, for a new Numerator, and the Denomina-*

tor

tor of the Dividend by the Numerator of the Diviſor, for a new Denominator. Let us place theſe two fractions as in common diviſion and try $\frac{2}{3})\frac{5}{7}(\frac{15}{14}$.

There is yet a ſhorter and a plainer rule, viz. *Reverſe one of the fractions; then multiply the two numerators and the two denominators:* thus $\frac{3}{2})\frac{5}{7}(\frac{15}{14}$

The quotient, I find, is 15 divided by 14. But why this *multiplication* ſhould be, in fact, *diviſion*, is by no means obvious: nor do I recollect any author who explains it ſufficiently. Firſt, let us conſider, that *ſeventhſ* cannot be divided into *thirds:* therefore, ſuppoſe I had never heard of any rule for dividing one fraction by another, I ſhould naturally begin by multiplying the numerators and denominators reciprocally, for two new numerators; and the denominators, for a common denominator: the reſult of which operation would be $\frac{15}{21}$, $\frac{14}{21}$. Now all the difficulty is vaniſhed. Since the denominators are the ſame, they become uſeleſs, and I can add, ſubtract, multiply, or divide the numerators in the ſame manner as if they were whole numbers. Now as $\frac{15}{21}$ is equivalent to the dividend, and $\frac{14}{21}$ equal to the diviſor, the quotient muſt be $\frac{15}{14}$.

But

But all this does not explain the rule: for you ſee that we have done without it. The rule, you know, is, to multiply the numerators by the denominators reciprocally. Now what is this, but reducing the two fractions to one denomination, and then dividing the greater numerator by the leſs? So that after all, this multiplication is merely the inſtrument for reducing the two fractions to a common denomination, and not an actual diviſion.

But to prove that our quotient is juſt, we will try whether, when multiplied by the diviſor, the product will be the dividend.

$$\begin{array}{cc} 15 & 14 \\ \hline 2 & 3 \\ \hline 30 & 42 \end{array} \qquad \frac{30}{42} = \frac{10}{14} = \frac{5}{7} \qquad \text{Q. E. D.}$$

The Diviſion of Decimal Fractions differs from the diviſion of whole numbers only in the art of pointing off the figures in the quotient: and the rule is—Point off in the quotient as many figures, counting from the right hand, as the number of decimals in the dividend exceeds thoſe in the diviſor. In other words: the number of decimals in the quotient and diviſor, muſt together, equal the number of thoſe in the dividend:

con-

conſequently, when the number of decimal figures in the diviſor and dividend is equal, the quotient will be whole numbers.

4,2)612,318(145,79
42
192
168
243
210
331
294
378
378

In the dividend there are 3 decimal figures; in the diviſor, but one: therefore, according to the above rule, I point off two figures in the quotient for decimals, the reſt being whole numbers.

We come now to the Diviſion of Algebraic quantities.

Firſt, you are to remember that (as in Multiplication) ſimilar ſigns give + and diſſimilar — in the quotient. *Secondly*, that when ſimilar quantities occur both in the diviſor and in the dividend, theſe quantities may

may be expunged. *Thirdly*, that the quotient is generally expreſſed by placing the dividend above and the diviſor beneath a line drawn between them, as in vulgar fractions. *Fourthly*, that coefficients are to be divided as in common Arithmetic; or divided by a common meaſure.

$$20ad \overline{)} 15ac \left(\frac{3d+c}{4d} \right.$$

In this example, I have divided the coefficients by 5 and expunged the letter *a*. The reaſon for dividing the figures by a common meaſure is ſelf-evident, and the reaſon for expunging this letter *a* will be no leſs obvious when you recollect, that letters, or quantities, thus written next to each other, as *ad* and *ac*, are ſuppoſed to be multiplied one by the other; and that, in vulgar fractions, the numerator and denominator, that is, the dividend and diviſor, being multiplied or divided by the ſame number, makes no alteration in their ralative value. But, to render this matter more intelligible, let us ſuppoſe *ac*, the dividend, to repreſent 4 multiplied by 6, and *ad*, the diviſor, to mean 4 multiplied by 2: now 4 times 6 make 24, and twice 4 is 8. If I divide 24 by 8 the quotient is 3. But if I take 4, of which

which a is the repreſentative, from both, the dividend will be 6, and the diviſor 2. I then ſay, how often 2 in 6? the anſwer is 3, as before.

As to the Diviſion of Algebraical Fractions, it is performed, as in Vulgar Fractions, by multiplying the numerators and denominators reciprocally, thus

$\frac{c}{d})\frac{a}{b}(\frac{ad}{cb}$. $\quad \frac{a+b}{a-b})\frac{a-b}{a}(\frac{a^2-2ab+b^2}{a^2+ab}$.

The ſecond example requires explanation. I begin by multiplying the Denominator of the Diviſor by the Numerator of the Dividend, thus: a multiplied by a produces aa; I write, in the product, one a with a ſmall figure of two over it, which figure is called its index, ſignifying the ſecond power of a, or the product of a multiplied by a. I then multiply the ſame $+a$ by $-b$, and $-b$ by $+a$, both which produce ab, and the ſigns being diſſimilar, I put down in the dividend of the quotient $-2ab$: finally $-b$ multiplied by $-b$ gives $+b^2$. I now multiply the numerator of the diviſor by the denominator of the dividend, and the product is evidently the denominator of the quotient.

Thus, I have endeavoured to give you a rational idea of Addition, Subtraction, Mul-

tiplication and Diviſion of whole numbers, fractions vulgar and decimal, and of Algebraic quantities. I ſay a *rational* idea, diſtinguiſhed from the mechanical ſyſtem of introduction, which you will find in the elementary books. What I have done is nothing more than a partial explanation, or analyſis, of the machines with which you are to work: a tolerable comprehenſion of their conſtruction, cannot fail to facilitate your future labours.

Vale.

LET-

LETTER XIV.

YOU are certainly right, I had forgotten that, in a former letter, I promiſed to introduce you to the acquaintance of the philoſopher Ariſtotle. I will now fulfil that promiſe, to the beſt of my recollection.

ARISTOTLE flouriſhed about three hundred years prior to the Chriſtian *æra*. He was born in a ſmall town in Macedonia named *Stagira*, and thence he is often called the *Stagirite*. Plato, Demoſthenes, and the great Alexander, were his cotemporaries. Of the firſt he was the pupil, and the preceptor of the laſt. He is generally regarded as the founder of the Peripatetic ſect of Philoſophers; though ſome hiſtorians tell us, that the denomination originated in Plato, who, it ſeems, was as fond of ambulatory ſtudies as myſelf: indeed thoſe who ſtudy Nature, will make no very rapid progreſs *ſub tecto*. They were called *Peripatetics* from περιπατεω, *ambulo*, to diſtinguiſh them from the diſciples of Xenocrates, who aſſumed the name of *Academics*, becauſe they aſſembled, at Athens, in the *Academy*; whilſt

the Peripatetics *walked* in the *Lyceum*. From this ſcrap of Grecian hiſtory, I ſuppoſe, the Artiſts in London, when they quarrelled with their brethren of the Royal Academy, dignified their room in the Strand, with the appellation of the *Lyceum*.

Whether theſe Peripatetics ſtudied in company or alone, may admit of doubt ſufficient to furniſh matter of diſcuſſion to a commentator on the Grecian hiſtory: be the fact however as it might, I adviſe you ſometimes to ſtroll out without company. If you wiſh to fix your ſerious attention to any ſubject of conſequence; or, if you be particularly deſirous of exerting, ſtimulating and expanding your imagination, you will find more aſſiſtance in the fields, from a genial atmoſphere, a ſerene ſky, a ſmiling landſcape, an extended horizon, than from the books on your table. I do not mean that you ſhould become a *miſanthrope*; that you ſhould always walk alone; far from it: chearful company is occaſionally as neceſſary to a ſtudious man as the air he breaths. But, as I obſerve that parties of freſhmen, in their walks, generally amuſe themſelves with leaping over hedges and ditches, though ſuch athletic ſports may be very wholeſome,

yet

yet I ſhould think it not neceſſary that every perambulation ſhould be thus employed.

Ariſtotle, we are told, wrote no leſs than four hundred books. If they were books of any ſize; if they were even pamphlets, they can hardly have been worth reading. I believe, in general, thoſe authors that have written *leaſt*, have written beſt. About twenty of theſe books are all that have eſcaped the deſtructive hand of Time, and the more relentleſs hand of Barbariſm. The ſubjects on which they treat, are *ethics*, *poetry*, *logic*, *rhetoric*, *politics*, *phyſics*, and *metaphyſics*. But, as he wrote without ſyſtem, without data, without method, and without preciſion, it is very difficult to aſcertain his opinions: and what greatly adds to the uncertainty is, that his works have come down to us through the turbid medium of Latin tranſlations from the Arabic, or Greek tranſlations from the Latin.

Ariſtotle appears, however, to have been the inventor of the art which we now call Logic, and of the ſcience of Metaphyſics. His Ethics deſerve but little praiſe. His Politics are prolix and obſcure: nevertheleſs, we muſt do him the juſtice to acknowledge, that, though preceptor to the ſon of

an abſolute prince, he had the reſolution to devulge, and to reaſon juſtly on, the patriotic maxim, that *princes are elevated to dominion, not for their own advantage, but for the felicity of the people.* He deſcribes the various forms of government then exiſting; expoſes their vices, and develops the cauſes of their corruption.

His ſyſtem of Rhetoric is doubtleſs a work of genius, and the labour of a mind capable of minute diſcrimination. His Logic is the Logic of every ſucceeding age, and of the preſent day. His Phyſics, or Philoſophy had no foundation. What he wrote, or rather what he is ſuppoſed to have written, upon Plants, is of very doubtful origin. But his book upon the Animal creation, is allowed to be genuine, and is indeed an aſtoniſhing performance. His anatomical and phyſiological deſcriptions, muſt have been the reſult of innumerable diſſections, unwearied aſſiduity, minute inſpection, and great ſagacity. He appears to have had no idea of ſyſtem or claſſification. His work is a continued deſcriptive compariſon of one animal with another, without a perfect identical deſcription of any individual. The various ſubjects which he diſſected, and

whoſe

whoſe habits he ſo well deſcribes, were collected at a vaſt expence, by order of his munificent and powerful pupil, prince, and patron, the conquerer of the then known world.

His philoſophical opinions are to be collected principally from his books *de Cælo*. He conſidered *matter*, *form* and *privation* as the principles of all things, and this *matter* he conceived to be eternal and indeſtructible. His *elements* are Fire, Air, Water and Earth. Theſe have ſtood their ground pretty well, till diſturbed by the chemical philoſophy of the preſent age, of which I may probably tell you more another time. He denied the annual and diurnal motion of the Earth, which Pythagoras had aſſerted, and was conſequently weak enough to ſuppoſe that the Sun, the Planets, and the fixed Stars; in ſhort, the whole viſible creation, turned daily round this atom, which we call Earth. Strange! that he ſhould not allow common ſenſe to the Creator of the Univerſe, who had given him ſo great a ſhare of human underſtanding.

When and where he died is not known; but his philoſophy lived and flouriſhed univerſally till towards the end of the laſt cen-

tury: being then gradually undermined by other philoſophers, Des Cartes finally blew it up, whoſe baſeleſs fabric, as I told you before, was, in its turn, annihilated by Sir Iſaac Newton.

I ſaid above, that Ariſtotle's ſyſtem of *Rhetoric* is a work of genius. It is an art which was formerly conſidered as an indiſpenſible branch of education in every part of Europe, and was accordingly taught, firſt in the ſchools, and afterwards purſued at the Univerſity, in Ariſtotle's technical language and manner. It has however gradually fallen into diſuſe: nevertheleſs, as ſome of the technical terms of this art are retained, it is neceſſary you ſhould know their meaning; I will therefore apply the remaining part of this letter to the explanation of thoſe terms which are moſt neceſſary to be underſtood.

Rhetoric, from ῥεω, *dico*, the Romans tranſlated *Oratoria*; by which they underſtood, the Art of ſpeaking with effect; the Art of perſuaſion. That it was an art in high eſteem and cultivation among the Greeks, appears from Quintilian, who, I think, mentions upwards of twenty eminent profeſſors of Rhetoric, in different parts of Greece.

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The Romans, notwithſtanding their eagerneſs to learn from their more poliſhed neighbours the Greeks, were, at firſt, ſo apprehenſive of the power of Oratory, that, by a decree of the Senate, they baniſhed all Greek philoſophers and rhetoricians. The prohibition, however, was of no long duration. Rhetoric was ſoon after ſtudied and taught as an art, and Rome produced a Quintilian and a Cicero.

That ſome advantage may be derived from the ſtudy of Rhetoric, I have no doubt; but, that the great art of Perſuaſion is generally a boon from Nature, I am much more inclined to believe. The moſt fluent and moſt perſpicuous ſpeaker I ever heard, was a Leeds merchant, the brother of Mr. John Lee, a gentleman eminent at the bar, and, ſome time, Solicitor General. Yet this Mr. Thomas Lee probably had never read Ariſtotle, Quintilian, Longinus, nor any ſyſtem of Rhetoric ancient or modern. We have at this time in both houſes of Parliament, orators, ſcarce, if at all, inferior to thoſe of Athens or Rome; yet theſe are more the pupils of Nature than of Art.

The purpoſe of Logic is, to convince; that of Rhetoric, to perſuade; and this art

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of perſuaſion depends moſt on a natural melodious tone of voice, a natural gracefulneſs of perſon and of action, a naturally expreſſive and intereſting form and diſpoſition of features: by *intereſting*, I rather mean what the French expreſs by the word *prevenante*, for which we have no equivalent in our language — I ſay, the power of an Orator over his audience, will always depend, in a great degree, on that which art cannot beſtow: nevertheleſs, the beſt gifts of nature want a little poliſhing. I have heard ſome eloquent members in the Houſe of Commons, who would have been much more perſuaſive ſpeakers, if they had ever learnt to dance: and though grammars, or ſyſtems of Rhetoric, may contribute nothing to the creation or embelliſhment of a fine ſpeaker; yet thoſe who are intended for the pulpit, the bar, or have any proſpect of a ſeat in Parliament, will gather much uſeful inſtruction and improvement, from a careful and frequent reading of Longinus and Quintilian, and, for illuſtration and example, Demoſthenes and Cicero; nor ſhould they neglect, in our own language, *Sheridan's Lectures on Elocution:* they contain a great deal of excellent matter.

As

As to artificial Logic, the Logic of the ſchools, it is of no more uſe in poliſhed diſputation, than artificial Rhetoric to a poliſhed Orator. One of the moſt rational and powerful diſputants I ever knew, was my late worthy friend Edward Gillyatt, of the Bank; yet he was totally ignorant of Logic, as an art. But, notwithſtanding the inutility of theſe two arts, they are neceſſary to be known by every gentleman who is not aſhamed to acknowledge, that he has had the advantage of an Univerſity education. I will therefore give you a ſlight ſketch of the art of Rhetoric, and an explanation of thoſe terms of that art, which are moſt neceſſary to be underſtood.

The Art of Rhetoric comprehends, Invention, Diſpoſition, Elocution and Pronunciation. As Grammar teaches the art of ſpeaking properly, Rhetoric inſtructs us how to ſpeak with elegance and effect. The two great inſtruments of this art, are Trope and Figure.

TROPE, *Tropus*, τροπος from τρεπω, *muto*, literally means a change of one word for another: *eſt voſis a proprio ſignificatione in aliam immutatio.* It is a word uſed not in its

its common acceptation, for the purpoſe of adding power or beauty to the ſentence. The *ſpecies* of this *genus* are four, *viz.*

Metaphora, μεταφορα, from μετα, trans, and φερω, *fero*. It is a ſimile expreſſed in one word, thus—*You ſhine a ſcholar.*—*The tinkling of that rill is muſic.*—*That lad is a lion.*—*That girl is an angel.*—*Eſt flos nobilitatis*, &c.

Metonymia, from μετα, and ονομα, *nomen*, a change of name: thus, when the cauſe is put for the effect, as, *You ſpeak the French tongue*. Or, the effect for the cauſe, as in the firſt Ode of Horace, *Præſidium et dulce decus meum*. Or, when the ſubject is put for the adjunct: thus, *Roma pro Romanis, vel patera pro vino*.

Synecdoche, formed of συνεκδεχομαι, *comprendo*, takes the whole for a part, or part for the whole; as for example in the firſt line of Milton's Paradiſe Loſt:—"*Of man's firſt diſobedience and the fruit*"—Here *man* is taken for *mankind:* ſo when the Latin poets uſe *auſter* for *wind*; or *falernum* for *wine* in general. In theſe examples, the *ſpecies* is taken for the *genus*, or the individual for the *ſpecies*.

ſpecies. On the contrary, the claſs is taken for the *genus* by Virgil when he ſays — *tollit ſe arrectum quadrupes.*

Ironia — diſſimulatio, illuſio, diverſiloquium, means the reverſe of that which is expreſſed: thus Terence — *ebodum, bone vir!*

Theſe are conſidered, by Rhetoricians, as the four primary Tropes, which they ſubdivide into a number of *ſpecies*; or to ſpeak more accurately and ſcientifically, *varieties*, not worth enumerating. Two of theſe however ſhould be remembered, *viz.*

Allegoria — inverſio, permutatio: a continued metaphor: *parturiunt montes naſcitur ridiculus mus.* The entire heathen mythology was by all the Greeks and Romans, except the vulgar, conſidered as allegorical. An *allegory* differs from a *ſimile* in this: in the former the ſubject proceeds without interruption; in the latter, you ſtop the ſubject, for the purpoſe of comparing it with ſomething ſimilar.

Hyperbole — ſuperlatio, is lying without deceiving: thus: *nive candidior — minus nihilo — teſtudine tardior* — ſtrong as an elephant — ſwift as an arrow — beautiful as an angel, &c.

Hitherto,

Hitherto, you know, we have been ſpeaking of what are called *Tropes*, which Rhetoricians diſtinguiſhed from *Figures:* by theſe they underſtood the mode of improving or adorning common language, not only by an artful application of *words*, but of entire ſentences. Theſe figures are ſo numerous, frequently ſo inſignificant, ſo puerile, and ſo confounded with their *Tropes*, that they are not worth remembering.

I ſhall finiſh my long epiſtle with what I conceive to be the beſt method of acquiring that moſt deſirable of all human accompliſhments, proper, graceful, and perſuaſive elocution. I ſay *the moſt deſirable*, becauſe the moſt brilliant, and effectual, whether our purſuit be power or emolument; and I dwell upon this aſſertion, becauſe it is impoſſible to inſpire a young mind with that degree of enthuſiaſm neceſſary to the attainment of a difficult object, if he be not previouſly convinced of its importance.

Young men who are intended for the pulpit, erroneouſly imagine, that if they can read a chapter in the Bible without ſtumbling, they are ſufficiently qualified for the prieſthood: "they learnt to read Engliſh before they were ſent to a grammar-ſchool;

from

from that time, therefore, it was uſeleſs to attend to what they had already learnt."— Hence it comes to paſs, that ſo many of our Clergy read a chapter in the Bible no better than a Charity-boy.

The requiſites in a good reader or a good ſpeaker, are diſtinct articulation, proper pronunciation, proper emphaſis, melody and pitch of voice, energy, animation, graceful attitude and action. Now, though Nature may have beſtowed ſome of theſe requiſites on a few favoured individuals, yet theſe individuals are thinly diſtributed; but we have the ſatisfaction to know, that, with due attention and aſſiduity, theſe requiſites may certainly be acquired.

Diſtinct articulation is to be acquired by frequently reading aloud and ſlowly; at firſt, very ſlowly.

Proper pronunciation depends principally on a critical attention to the proper ſound of all the vowels in our language. I know a Clergyman, who has deſervedly the reputation of a good preacher, whoſe preaching, nevertheleſs, is, to a nice ear, extremely diſguſting; becauſe, from a provincial habit, in his pronunciation he miſ-ſpells almoſt every word he utters; his *a* is an *e*, his *e* is an

an *i*, his *o* is a *u*. Surely a very little attention would have corrected this conſtant impropriety.

Proper emphaſis will depend principally on a perfect comprehenſion of your author's deſign, and on a clear diſcrimination of the words which he meant to be emphatically expreſſed: without this diſcrimination, you will conſtantly pervert his meaning, and the fineſt compoſitions will loſe their effect. The beſt means of acquiring the habit, the art, of emphatic expreſſion, is to read aloud, repeatedly and ſlowly, the orations of Demoſthenes and Cicero, in the original Greek and Latin; to ſtudy them inquiſitely as you proceed; to tranſlate parts of them into your native language; to read that tranſlation to your aſſociates, and to mark the effect.

Melody and pitch of voice. A ſweet toned voice is, doubtleſs, a very valuable gift from Nature; but, in its natural ſtate, it is *vox et præterea nihil.* It is a fine *Stradevarius* in the hands of a *Crowdero.* The organs which produce the human voice, form a muſical inſtrument, made by that Divine hand, whoſe works no art can rival. Nature alſo gave us diamonds; but ſhe left them for Art to poliſh. By conſtantly playing upon a muſical

muſical inſtrument, we not only improve its tone, but we gradually acquire that degree of dexterity which is neceſſary to give it a complete effect. So it is with the human voice. You muſt practiſe with the unremitting aſſiduity of a young muſician, until you have familiarized every poſſible modulation.

Energy in ſpeaking, like the mercury in the barometer, ſhould riſe and fall with the weight of your ſubject; and your proper uſe of this power will depend on your clearly underſtanding the comparative importance of its ſeveral parts.

Animation will always be in a direct *ratio* of your own feelings. Like two muſical ſtrings in perfect uniſon, your own heart muſt vibrate, before thoſe of your audience can feel.

Graceful attitude and action, may ſeem to be the work of Nature. It is evidently a miſtake. Nature may give fine features and limbs faſhioned in her beſt mould, to a clown; but, whoever beheld a clown ſtanding in a graceful attitude, or raiſe his arm like *Veſtris*? It is evident that gracefulneſs in reading, in ſpeaking, and in acting, is incompatible with the leaſt degree of em-

barraſſment. If an Orator be not perfectly at eaſe, he will give to his audience rather pain than pleaſure: they perceive his embarraſſment, and they feel it: let it, therefore, be his firſt care, to diveſt himſelf of that troubleſome companion which the French call *mauvaiſe honte*; that offspring of conſcious inferiority; that badge of low breeding; that frequent, very frequent, obſtacle in the road to pre-eminence; that diſgrace of man!

But, you will aſk me, by what means this gracefulneſs, this urbanity of manner, is to be attained? Is it by precepts or rules? — By neither; but by example and by practice: for, without example, you can form no idea of a *je ne ſcai quoi*; a thing incapable of deſcription. Yet, in ſaying, that it is to be learnt by example, I do not mean that the *manner* of any individual orator is to be copied. No: he muſt be ſtudied ſolely for the purpoſe of aſſiſting your mind in forming a juſt idea of that kind of action and attitude, which, at once, diſtinguiſhes a man of the polite world from a ruſtic.

Where are we to look for theſe examples, theſe modals of gracefulneſs? — In the Senate? — I have heard, in my time, ſome graceful

graceful ſpeakers in either houſe — moſt in the houſe of Lords; but many more in both, who would have diſgraced a debating ſociety in the City. Shall we then ſeek theſe models at the Bar? — I fear, at the Bar, there is not much *grace* to be found: yet there are, who both ſpeak and *act* like gentlemen. The pulpit? — Alas! the orators from the pulpit, have, in this kingdom, long ſince, reſigned *action*, the moſt powerful inſtrument of Rhetoric, to St. Criſpin and his diſciples. The Stage, then, is our *derniere reſort*; and a miſerable reſort it is! There are not, in general, a more — I will not ſay *graceleſs* — you would call it a pun; but, I will ſay, a more *aukward* fraternity of *gentlemen*, any where to be found. If, however, you wiſh to form a juſt idea of all the beauty ariſing from attitude and from motion, (particularly of the arms,) of which the human body is capable, you will ſee it — not to imitate — in the perſon of an Opera Dancer.

Hamlet's inſtruction to a ſet of ſtrolling players, will illuſtrate what I have written.

" Speak the ſpeech, I pray you, as I pronounced it to you, trippingly on the tongue: but if you mouth it, as many of our Players do, I had as lieve the Town-cryer had ſpoke

my lines. And do not ſaw the air too much with your hand thus, but uſe all gently; for in the very torrent, tempeſt, and, as I may ſay, whirl-wind of your paſſion, you muſt acquire and beget a temperance that may give it ſmoothneſs. Oh, it offends me to the ſoul, to hear a robuſtous periwig-pated fellow tear a paſſion to tatters, or very rags, to ſplit the ears of the groundlings, who, for the moſt part, are capable of nothing but inexplicable dumb ſhews and noiſe. I could have ſuch fellows whipt for overdoing termagant: it out-herods Herod. Pray you avoid it."

Vale.

LET-

LETTER XV.

AMBITION is a virtue or a vice as its object is juſt or unjuſt. In Alexander *qui æſtuat infelix anguſto limite mundi*; in Cæſar, in Lewis XIV. the object of their battles was power and dominion, to which they had no juſt claim: the firſt and laſt trampled on the univerſal law of nations; Cæſar broke the ſacred laws of civil compact. But the ambition to excel in poetry, in muſic, in painting, in mathematics; or to command an army, a fleet, or even to govern the ſtate, is a virtue; not becauſe it may raiſe an individual, but becauſe the emulation of many individuals muſt eventually benefit the community. In abſolute monarchies, ſubjects riſe to power more frequently on the wings of vice, than of virtue; of intreague, than of abilities. In ariſtocratical or democratical governments, ambitious, cunning, reſolute men, without probity or abilities, often rule the ſtate. Why?—Becauſe a republic is a body without a head: it wants that ſupreme executive

power, which can annihiliate a dangerous miniſter by a frown.

In the mixed government under which you have the felicity to be born, as the Miniſter is reſponſible for the miſconduct of the King, ſo is the King, in ſome degree, anſwerable for the mal-adminiſtration of the man whom *he delighteth to honour:* and this implied reſponſibility is juſt; becauſe the conſtitution gives to the King the power of chuſing his ſervants. Some of our Kings, either for want of penetration, or in conſequence of perſonal attachment, have been very unfortunate in the choice of their Prime Miniſters; but the conſequences of their miſconſtruing individual men, were ſo fatal to themſelves, that future Kings of England will be cautious whom they truſt.

In our preſent firſt Miniſter we have a fine example of what power and dignity may be attained by ſuperior underſtanding, in conjunction with application and good morals. Without theſe in an eminent degree, his being the ſon of the late Lord Chatham would have availed him nothing. That good morals ſhould have been a ſtep to Mr. Pitt's elevation, would to the politi-

cians

cians of the Machiavelian ſchool, have appeared ridiculous; but I will venture to affirm, that, if Mr. Pitt, be his abilities what they may, had been a gambler, or had been known to debaſe human nature by any ſpecies of debauchery, we ſhould never have beheld him in his preſent exaltation. Lord North, by a ſeries of unſucceſsful attempts to prevent the independence of our American brethren, had loſt the confidence of the nation, and, by an enormous accumulation of the national debt, had ruined our credit both at home and abroad. So ſituated, no human policy or power, without an immediate reſtoration of that credit, could have ſaved us from abſolute perdition.

Now, to produce this great, this important effect, it was neceſſary to chuſe a firſt Miniſter eminently conſpicuous for abilities, application, knowledge, reſolution and integrity. It ſeems very extraordinary that theſe five eſſentials ſhould have been generally perceived and acknowledged in ſo young a man.

The firſt of theſe *abilities*, that is, a capacity to learn, is doubtleſs a boon from Nature: in this boon, however, ſhe is more generally liberal than Indolence is willing to

allow. The remaining four eſſentials, every young man of abilities may poſſeſs; otherwiſe the want of them were unjuſtly reprehenſible.

I have before obſerved, that Mr. Pitt's moral character was the *primum mobile* of his elevation; and I found this obſervation on the recollection of there being, at the time of his appointment to the Miniſtry, ſeveral members in both houſes, of diſtinguiſhed abilities; but, in the then critical ſituation of this country; when our ſalvation depended on an univerſal confidence in the integrity of the Miniſter; it was wiſely determined, that a young man of at leaſt equal abilities, but of irreproachable character, was moſt likely to retrieve and re-eſtabliſh that credit and confidence ſo neceſſary to our exiſtence.

Britain, at the concluſion of the American war, reſembled a ſhip, heavily loaded; her rigging and timbers ſhattered in the late ſtorm; her crew fatigued and diſpirited; her officers either unſkilful, or worſe; a dangerous navigation; no land in ſight, and without a pilate. Deſpair marked the countenance of every man on the Quarter Deck. What was to be done? — "Pleaſe your

your honour, ſays the Boatſwain to the Captain, we have a young Midſhipman on board, who underſtands navigation as well as any man in the King's ſervice; he's always at his books and charts, and never neglects taking an obſervation at noon. If your honour will make him Pilate for the voyage, I am ſure God will ſave the *Britannia*; for this young man neither gets drunk, nor gambles, nor ſwears an oath."

The ſtrongeſt argument in favour of virtue, is, that vicious men have no dependence on vice; and that, in every diſtreſsful emergency, they fly to virtue for protection. Let us imagine a ſhip, in the ſituation of that in the firſt ſcene of Shakeſpear's *Tempeſt*. Sailors believe that ſhipwreck diſſolves all ſubordination. Nevertheleſs, ſuppoſe them now caſt on an unknown coaſt; every individual ſuſpicious of his companions; apprehenſive of ſavage men and beaſts, and conſcious of the neceſſity of appointing a commander. Their quondam Captain is a man of abilities; but they have no opinion of his honeſty; they knew him to be a gambler, and inattentive to the duties of religion. The firſt Lieutenant, on the contrary, is a man of equal abilities, of ſtrict morals, and

and approved integrity. Can there be a doubt on whom the choice would fall? Every ſailor, how profligate ſoever, is convinced, that, in the deſtribution of the wreck, a diſhoneſt Captain will appropriate to his own uſe the beſt part of the ſpoil, and he verily believes, that Providence will hear the prayers and proſper the exertions of a good man.

Mr. Pitt's elevation may be conſidered, not only as the means of reſcuing this nation from impending ruin; but as a fine example to young gentlemen, ſtudents at our Univerſities, who, from family or fortune, may expect a ſeat in Parliament; where hiſtorical information, uniformity of character, and natural or acquired elocution, muſt, in deſpite of every obſtacle, lift them into the higheſt employments in the ſtate. What a glorious incentive to application!

I have ſaid elocution *natural* or *acquired*; becauſe I have no doubt, that elocution, this moſt deſirable and moſt beneficial of all qualities, though ſometimes a natural endowment may be always acquired. If we may credit the Grecian hiſtorians, Demoſthenes, the prince of orators, had originally, in ſpeaking, an indiſtinct articulation; a natural

tural ſtammer, an impediment in his ſpeech; they tell us, that, in order to cure himſelf of this defect, he practiſed ſpeaking with pebbles in his mouth, probably on the ſame principle that a man walks in boots the day before he intends to run a race.

Be this anecdote true or fabulous, we may, I think, rationally conclude, that Demoſthenes, finding in himſelf every requiſite to become a diſtinguiſhed orator, except diſtinct articulation; animated by that noble enthuſiaſm which is the foundation of great diſtinctions in ſociety, reſolutely determined, by unremitting aſſiduity, to attain, by art, that which nature had not beſtowed. He knew the ineſtimable value of perſuaſive elocution in a government like that of Athens: he knew the power of an orator, who, as Virgil elegantly ſays—*regit dictis animos et pectora mulcet*—

Ovid, too, though perfectly ſenſible of the power of beauty, aſcribes the paſſion of the Marine deities for the hero of the Odyſſey, entirely to his elocution.

Non formoſus erat, ſed erat facundus Ulyſſes,
Et tamen æquoreas torſit amore Deas.

Having thus wandered into claſſical recollections,

collections, it is impoſſible to forget the following elegant panegyric on elocution, of the Roman orator — *Neque vero mihi quidquam præſtabilius videtur, quam poſſe dicendo tenere hominum cœtus, mentes allicere, voluntates impellere quo velit; unde autem velit, deducere.*

If then it be true, that Eloquence is the moſt infallible ſtep-ladder to fame, power and emolument, how ſhall we account for its being totally neglected, as a branch of education, in both our Univerſities? What are the probable advantages of mathematical learning, or, from a critical knowledge of Greek and Latin poetry, compared with what might be expected from a regular courſe of lectures on Eloquence, delivered by the Public Orator, or by a profeſſor of Oratory? There are profeſſors of Arabic and profeſſors of Muſic; but we look, in vain, in the red book, for a profeſſor of the only art or ſcience, call it which you pleaſe, by means of which young men can expect to diſtinguiſh themſelves in the ſenate, at the bar, or in the pulpit.

There are in this, and probably in every other Univerſity, many ſtudents who know themſelves, in point of fortune, totally independent

dependent of the world, and consequently careless of its future smiles or frowns; but I am persuaded, that, if the utility of the system of education were more apparent, they would apply. *Damn it*, says a Fellow Commoner, *what have I to do with Mathematics? and as for Homer and Virgil, I learnt enough of them at school.*

I humbly conceive, that Quintilian should be particularly recommended to every student in the University; that it would be a proper text for a course of lectures, and that every pupil, of a certain standing, should be repeatedly exercised in public declamation.

The present Prime Minister may possibly, in some future period, find leisure to bestow a little consideration on a matter of so much importance as the reformation of the Universities. He was himself educated at Cambridge; he cannot therefore be insensible of the Gothic absurdity of a system, which is not well calculated for the education either of Gentlemen, Lawyers, Physicians, or Divines. Nevertheless, I am very far from intending the most distant reflection on any individual in the University. The imperfections are not recent abuses; but the natural result of an un-

unavoidable adherence to the ſtatutes of eſtabliſhments which do honour to this nation, and which have, incontrovertibly, been of infinite benefit to mankind.

I am, &c.

LET-

LETTER XVI.

YOU have, I think, frequently been preſent when the queſtion, "Whether private or public education be moſt eligible," has been diſcuſſed by men of candour and abilities; and probably you recollect, that the principal arguments in favour of the latter are,—that, in public ſchools, boys become better claſſical ſcholars; that, mixing with a greater variety of characters, and being, in a greater degree, left to themſelves, they are better qualified to mix with the world at large. The chief argument in ſupport of a more private education, is,—that in this line, a greater attention is paid to the religion and morals of the pupils, and therefore, thoſe who have been more ſucceſsful in private ſtations, are generally men who have been privately educated.

If theſe arguments be founded on truth, we may rationally ſuppoſe, that a young man iſſuing from a public ſchool, comes to the Univerſity in a ſtate of nature; with a mind unimpreſſed with any fixed principles of religion or morality, and conſequently under

under the abſolute dominion of ſtrong paſſions, at an age when Reaſon, their only poſſible counterpoize, has hardly begun to dawn. At a more advanced age, when reaſon has acquired ſome ſtrength, it may be a ſufficient defence againſt the attacks of vice; but, in its infant ſtate, it has no power; therefore Religon is the ſole guardian of young men emerging from a public ſeminary.

On this conſideration, the college of which you have the honour to be a member, wiſely ordains, that your academical ſtudies ſhould commence with a commentary on that book which is the foundation of the religion you profeſs. "What (ſome of your fellow ſtudents will ſay) have we to do with the Chriſtian Religion? We are not all intended for *parſons*; and if we were, it will be time enough to ſtudy divinity when we take Orders."—In anſwer to this fooliſh rhapſody, I repeat;—the College, conſidering that young men, from public ſchools, come to the Univerſity mere claſſical ſcholars, totally deſtitute of religious or moral inſtruction, hath wiſely conceived that the evident morality of the Goſpel would be the moſt immediate and effectual counterpoize to vice, until reaſon,

reaſon, independent of religion, ſhould acquire ſufficient ſtrength to convince them, that vice is the extreme of folly.

In your convivial aſſociation with your fellow-freſhmen, you will frequently hear the early and conſtant attendance at Chapel, exclaimed againſt as a *bore*. Nevertheleſs, there are arguments of conſiderable weight in favour of this inſtitution. Early riſing is certainly conducive to health; not only becauſe the morning air is ſalutary, but becauſe it muſt neceſſarily induce an early retirement to reſt. Thoſe who riſe late read little, and their laſt hours of the day, or rather night, are often ſpent in a manner diſgraceful to human nature, and irrecoverably deſtructive to body and mind.—*Tenebras magis quam lucem amaverint homines, quippe quorum prava forent opera.*

Young men that keep good hours are rarely immoral. There is yet another argument in favour of early devotion, which a young mind capable of religious ſenſibility, will feel: I mean the ſatisfaction of having began the day in a manner moſt acceptable to his Creator. This reflection will inſpire him with confidence; it will raiſe his ſpirits; it will make him ſatisfied with him-

ſelf; it will conſequently baniſh all propenſity to ill temper, and render him a pleaſant companion to all his acquaintance. I never meet with a peeviſh, ill-tempered fellow, without ſuſpecting that all is not right within. I cannot help ſuppoſing that he has reaſon to be diſſatisfied with himſelf; becauſe a long acquaintance with human nature, in various climates and ſituations, hath convinced me, that chearfulneſs and good temper are the natural produce of innocence.

But theſe ſalutary effects of early devotion neceſſarily ſuppoſe a mind ſuſceptible of reflection; a mind capable of perceiving the hourly dependence of the creature on its Creator; a mind naturally diſpoſed to believe the truth of the Chriſtian religion on the credit of the wiſeſt men that ever exiſted in any age or country. Locke and Newton were both zealous Chriſtians. With regard to their ſincerity *there is not a loop to hang a doubt on*, and ſurely no human beings were ever better qualified to ſeparate truth from falſehood.

I do not mean to inſinuate, that, in the important article of Religion, it were wiſe finally to reſt your faith on the opinions of other

other men: in mentioning Locke and Newton, I have no other intention than to prove the reaſonableneſs of relying on their judgment, until time ſhall have ripened your own, and until you may have leiſure to read the beſt authors that have written in ſupport of divine Revelation.

I cannot cloſe this grave epiſtle without adviſing you to contract no intimacy with young men whoſe parents or guardians, by ſupplying them with large ſums of money, lead them into perpetual temptation to frivolous and vicious indulgences. By exhauſting your credit, you may poſſibly keep pace with them for a time; but, the moment you are aground, they will laugh at your diſtreſs, and, without giving you any aſſiſtance, will purſue their voyage, damning your ſtupidity for pretending to ſail with *them*.

One would not imagine that hunting and horſe-racing could be an admiſſible part of Univerſity education. The vicinity of Newmarket, and its frequent meetings, now conſtantly attended by the firſt perſonages in the kingdom, are doubtleſs irreſiſtible temptations to young gentlemen who are not ſent to the Univerſity in purſuit of knowledge; but alas! the example is inevitable

deſtruction to thoſe ſtudents, who, without the means, are ſeduced to imitate their ſuperiors in rank and fortune; to thoſe ſtudents who were ſent to the Univerſity for the only rational purpoſe for which Univerſities were originally inſtituted.

I do not preſume to arraign the conduct of royal perſonages. Horſe-racing, unconnected with gambling, may be an innocent amuſement; but, having always conceived that money is the ſole object of wagers, I cannot imagine why perſons who can never want money, ſhould become gameſters. But, allowing that young princes find ſome amuſement in throwing handfuls of counters—to princes, guineas are mere counters—upon the turf, for blacklegs to ſcramble for, the conſequences to princes are imperceptible; whether they win or loſe, they can never be diſtreſſed. Not ſo with thoſe who are ſeduced by illuſtrious example.

Mantua, væ miſere nimium vicina Cremonæ!

Cambridge is indeed unfortunately too near Newmarket: not becauſe it is the ſcene of perpetual horſe-racing; but becauſe it is the centre of illegal gambling of every denomination; the vortex of the moſt diſhoneſt

neſt and moſt contemptible members of ſociety. That young men of family and fortune ſhould condeſcend to mix with ſuch miſcreants, for the paltry purpoſe of winning a few guineas, is ſo glaring a reflection on the character of a gentleman, that nothing ſhort of ocular demonſtration could render it credible.

You have, I believe, heard me ſay, that I think mankind not only the leaſt amiable, but the moſt irrational part of the creation. The celebrated Dean of St. Patricks has been frequently abuſed for this opinion. Let thoſe who think otherwiſe compare the *horſes* at Newmarket with the *men*. Let them firſt obſerve them on the courſe. Let them follow the Horſes into the ſtable, and the Men to that *Pandæmonium* in which gentlemen ſpend the evening at Newmarket. E O-tables—hazard-tables—card-tables—Lords, Commoners, Fellow-commoners, Penſioners, Black-legs, Highwaymen and Pickpockets; lying, curſing, ſwearing, cheating, blaſpheming!—Can you poſſibly contemplate ſuch a picture without horror? I hope you cannot.

Let us now ſuppoſe that a choir of Angels were to look down upon Newmarket,

(this being their firſt view of the inhabitants of this planet,) and that they were aſked, whether, if they were obliged to ſojourn a while upon Earth, they would be men or horſes? is there a Spirit among them who would not prefer the latter mode of exiſtence?

It has been frequently obſerved, and I think juſtly, that individuals generally act more rationally than aggregate bodies of men: how ſhall we otherwiſe account for that legiſlatorial ſupineneſs which continues to poſtpone the total ſuppreſſion of theſe licenſed ſeminaries of vice; when there is hardly an individual in the kingdom who is not perfectly convinced, that all race-grounds, and particulaly Newmarket, are the nurſeries of ſharpers, the ſchools of highwaymen, and the graves of morality?

Human underſtanding is a plant, which, individually, advances very ſlowly to maturity; but its progreſs in ſociety is yet much leſs rapid. Many of the philoſophers of ancient times ſaw, and deſpiſed, the abſurdities of the heathen ſyſtem of religion, whilſt their reſpective nations continued their adoration of fictitious, immoral, profligate deities. Probably the period is not very far remote,

remote, when the Britiſh Legiſlature will comprehend, that the moſt effectual means of annihilating that opprobrious race of highwaymen, ſharpers and gamblers, were to ſtrangle the Hercules in the cradle. The total abolition of Horſe-racing and Cock-fighting, would do more towards the prevention of thoſe felonies with which this nation is peculiarly ſtigmatized, than all the penal laws that can poſſibly be invented.

Adieu.

LETTER XVII.

I RECOLLECT, that, in ſome part of my laſt letter, I gave you what ſeemed to me a ſufficient reaſon why *Beauſobre's Commentary on the Goſpel of St. Matthew* was among the firſt books put into your hands by your Tutor. The College perfectly acquainted with your total ignorance of any ſyſtem of Morality, and equally uninſtructed in the fundamental proofs and tenets of Chriſtianity; conſequently, conſidering you as a veſſel launched into a dangerous ocean without a compaſs — wiſely begins your Univerſity education with the inſtitutes of Chriſtianity.

To you, who have been told that the late King of Pruſſia was a declared infidel in regard to the divine origin of Chriſtianity, it muſt appear ſtrange, that the above mentioned Commentary ſhould have been undertaken at the command of that monarch. The tranſlator's preface tells you, that — It having been repreſented to his Majeſty that the French verſions of the holy Scriptures, being, by length of time, become obſolete and

and unintelligible, it was neceſſary to make a new tranſlation, he ordered Meſſrs. Beauſobre and Lenfant to undertake the work; which they executed, with the addition of a commentary on all the difficult paſſages, &c.

This attention to the Goſpel in the Pruſſian monarch was not the effect of his religious veneration for the writings of the Evangeliſts; it muſt therefore be aſcribed to his political ſagacity: it was, however, an evident acknowledgment of its importance to ſociety, and a plain confeſſion of its neceſſity. But, be his faith what it might, in his various correſpondence with Unbelievers, he always ſpeaks of the morality of the Goſpel with veneration.

A human Being totally deſtitute of religion, is not a degree above the brute creation. Particular ſyſtems of Religion out of the queſtion, it requires very little reflection to perceive, that the wonderful creation around you is not the effect of any fortuitous arrangement of inanimate matter; an opinion, though ſtrenuouſly maintained by ſome philoſophers, much too abſurd to deſerve a ſerious refutation: It is ſuppoſing an *effect* without a *cauſe*, than which nothing can be more ridiculous. What were the

ſenti-

ſentiments of the inimitable Cicero on this ſubject?

Quid poteſt eſſe tam apertum, tanque perſpicuum, cum cælum ſuſpeximus, cæleſtiaque contemplati ſumus, quam eſſe aliquod Numen præſtantiſſimæ mentis quo hæc regantur?

Mr. Addiſon in his celebrated trajedy, makes his hero, in conſequence of a ſimilar reflection, exclaim

——— If there's a pow'r above us,
(And that there is, all nature cries aloud
Through all her works) he muſt delight in virtue:
And that which he delights in, muſt be happy.

This is doubtleſs a rational concluſion. But the reaſoning faculties, which diſtinguiſh men from brutes, were not beſtowed for the ſole purpoſe of contemplating the creation, but to guide us through the intricate paths of life. Man, I had almoſt ſaid *unhappily*, unendowed with *inſtinct*, that unerring reaſon of Nature, received from Heaven the power of ratiocination, of recollecting and comparing his ideas; of forming concluſions, and conſequently of diſtinguiſhing good from evil. Hence, the conſtitution of Virtue and of Vice. Without this power of diſcrimination, Virtue could

have

have had no exiſtence, and Vice was as neceſſarily the conſequence of the exiſtence of Virtue, as vallies are produced by the elevation of mountains, or darkneſs by the abſence of light.

On this philoſophy is founded the Chriſtian doctrine of rewards and puniſhments: a doctrine ſo rational and ſo juſt, that it burſt prophetically on the imagination of the almoſt inſpired Cicero. Scipio, relating his dream, tells his auditors, that, meeting his father, Paulus Emelius, in the cœleſtial regions, he ſaid, among other things,—*juſtitiam cole et pietatem, quæ cum magna ſit in parentibus et propinquis, tum in patria maxima eſt: ea vita via eſt in cœlum, et in hunc cœtum eorum, qui jam vixerunt, et corpore laxati, illum incolunt locum quem vides.*

As to the ſouls of thoſe *qui ſe corporis voluptatibus dediderunt*, he excludes them heaven, until, as a puniſhment for their crimes, they have ſpent ages in fluttering round the Earth, *circum Terram ipſam volutantur.*

Horace too, you remember, in his charming Ode to Mercury, aſcribes to him the grateful office of conducting pious ſouls to heaven.

Tu

Tu pius lætis animas reponis
Sedibus ——

So that, you ſee, the moſt diſtinguiſhed literati, in an age when human genius ſeems to have reached its *ne plus ultra*, were powerfully impreſſed with a belief of future exiſtence and of reward and puniſhment. They ſaw the unequal diſtribution of good and evil on Earth. They were convinced of the power and benevolence of the Creator. It was impoſſible to ſuppoſe him an unjuſt Being: therefore they were under the neceſſity of concluding, that virtue muſt be rewarded in another life.

But, we are told, that Virtue is its own reward. So it is, to a certain degree. In equal ſituations the virtuous man will be incomparably the moſt happy; but this does not ſecure him from the gripe of penury, from the heart-rending pangs of a Lear, inflicted by *a thankleſs child!* No, theſe are ſufferings which no virtue could ſupport, without the ſoothing expectation of a happier eternity.

That virtue is its own reward in our intercourſe with mankind, is moſt true. Vicious men are miſtruſted and deſpiſed, even by

by the vicious themſelves. A man without character ſoon becomes an outcaſt of ſociety. Let it therefore be your firſt care to eſtabliſh a firm character for ſcrupulous veracity. A lie admits of no apology. This truth is ſo generally underſtood, that even among the moſt profligate, what is called *giving the lie* muſt be atoned for at the hazard of life. But, do not therefore haſtily conclude, that you are to ſend a challenge to every ill-mannered or drunken puppy who dares to diſpute your veracity. I mean only to prove the vice of lying to be ſo univerſally deteſted, that to tell a gentleman he is guilty of it, is the moſt unpardonable offence; and very juſtly, becauſe it is, by implication, calling him a coward. A man of true courage will diſdain the protection of a falſehood, were it even to ſave his life. When he has once paſſed the *Rubicon*, he will march boldly on to the capital. He has *put his life upon a caſt*, and will nobly *ſtand the hazard of the die*.

There is indeed, in this *trait* of a great character, no medium; and it becomes infinitely deſirable when you reflect on the influence it will have on all your actions. If you are poſitively determined to preſerve your

your veracity, you will ſeldom perpetrate what you would be aſhamed to confeſs. Be Truth therefore your *Palladium:* I cannot bequeath you a better inheritance.

Vale.

LET-

LETTER XVIII.

I SHALL in this letter reſume the ſubject of perſonal Courage, which Mr. Addiſon, ſome where, calls *active fortitude:* it is a ſubject of too much importance to a young man to be lightly diſmiſſed. I remember when, in the year 1778, I was waiting at Portſmouth to embark for America, I became acquainted with the Mr. Walters, who ſailed round the world with Lord Anſon, as chaplain to the Centurion, and who publiſhed the account of that voyage. He was an intelligent man, a rational divine, a generous hoſt, and a pleaſant companion.

One morning, as we were walking together on the rampart, and caſually ſpeaking of *fear*, he emphatically ſaid, *Fear! fye upon it! it is an ignoble paſſion, and beneath the dignity of man!* — I could have hugged him to my ſoul; yet there was nothing ſtrikingly new in this ſentiment. Probably I had heard it many times before; but never ſo emphatically expreſſed, nor ſo perfectly in uniſon with my own feelings at the time. The impreſſion on my mind became indelible.

There

There is ſomething ſo irreſiſtibly bewitching in perſonal courage, that we have hardly an inſtance of a truly brave General or Admiral, who was not adored by every ſoldier, or ſailor, under his command. Shakeſpeare, who was no novice in the knowledge of human nature, makes the young and beautiful Deſdemona violently enamoured of a gallant ſoldier, a Moor, and already

——— *declined*
Into the vale of years.

But, ſays this amiable heroine,

I ſaw Othello's viſſage in his mind,
And to his honours and his valliant parts
Did I my ſoul and fortunes conſecrate.

Ariſtotle, if I remember right, in his Ethics, aſſigns to Courage the firſt place in his enumeration of moral virtues; and with reaſon; for there is nothing more precarious than the virtue of a coward: he ſhrinks at the approach of danger or difficulty, and yields to temptation, for want of reſolution to reſiſt it. The beſt proof of a man's real Courage, is to dare, in every ſituation, to be juſt to his own principles, to himſelf, to his

his connexions, and to the world. Men ſo fortified may ſay, with Horace,

Si fractus illabatur orbis,
Impavidum ferient ruinæ.

And, let me tell you, be your future proſpects through life ever ſo flattering, you will, moſt aſſuredly, be thrown into ſituations, where you will be exceedingly glad to repoſe on your conſcious integrity: you will moſt certainly find it, by far, your beſt ſupport under the various diſappointments, calumny and ingratitude of a ſtrange, a very ſtrange world!

There are, I believe, few men, who, when they begin to throw off the boy, do not make ſome ſort of reſolution to eſtabliſh a character in the world, and to act like men of honour; unfortunately, they meet with temptations which they did not expect, and they ſwerve under a *ſalvo*, that they wiſh to be honeſt, but that it is every man's duty to do the beſt he can for himſelf and family. This is a moſt egregious miſtake. There is but one honeſty, one honour, one integrity, one virtue. They are all either abſolute, or they do not exiſt; and I appeal to thoſe men who have thus ſwerved from

what they knew to be right, whether the recollection of their deviations from the plain path of virtue, does not now conſtitute their greateſt infelicity?

I have mentioned *honour*; I will therefore give you my idea of a man of honour. Perſonal courage is doubtleſs a neceſſary part of his character; and this eſſential he ſhould eſtabliſh at his firſt emerging into man: not by a querulous propenſity to contradiction; not by a promptitude to take offence; but by that cool and ſteady demeanour, which may convince his aſſociates of his reſolution to maintain his own rights, and to ſupport his friend in a juſt cauſe, even at the expence of a little prudence. This part of his character once eſtabliſhed, he will run very little riſk of future inſult.

About the middle of the preſent century, I was member of a club, in the country, the preſident of which, a worthy clergyman, generally drank milk-punch; and, thence, in deriſion, it was called *the Milkſop Club*. One evening two of our members, a choleric Phyſician and a young Divine, were engaged in a violent diſpute.—"Sarrah," ſays the Doctor, "if it were not for that band of thine, I would ſoon teach thee better manners."

—The

—The young parſon, without ſpeaking a word, deliberately took off his band, and laid it on the table. The Doctor's choler inſtantly ſubſided, and the company laughed heartily at this concluſion of the duel. Now, though this behaviour of the Divine might not be ſtrictly canonical, yet it gained him more general eſteem than the beſt ſermon he could have preached.

A *man of honour*, a *gentleman*, they are ſynonimous terms, is eminently diſtinguiſhed from the reſt of mankind, by the uniform unreſtrained rectitude of his conduct. Other men are honeſt in fear of the puniſhments which the Law might inflict: they are religious in expectation of being rewarded, or in dread of the Devil, in the next world. A *gentleman* would be juſt, if there were no written laws human or divine, except thoſe that are written on his heart by the finger of his Creator. In every climate, under every ſyſtem of religion, he is the ſame. He kneels before the univerſal throne of God, in gratitude for the bleſſings he has received, and in humble ſolicitation for his future protection. He venerates the piety of good men of all religions. He deſturbs not the religion of his country, becauſe the agita-

tion of ſpeculative opinions, produces greater evils than the errors it is intended to remove. He reſtrains his paſſions, becauſe they cannot be indulged without injuring his neighbour or himſelf. He gives no offence, becauſe he does not chuſe to be offended. He contracts no debts which he is not certain that he can diſcharge, becauſe he is honeſt upon principle. He never utters a falſehood, becauſe it is cowardly, and infinitely beneath the dignity of a Gentleman. He bribes no man for his vote, becauſe he will not make a villain. He meaſures all offences by the intention; but he reſents with the ſpirit of a gentleman, every palpable inſult; becauſe, in the preſent humour of the world, it is the only means of preſerving good manners, and of ſecuring to himſelf that reſpect, which, as a juſt man and a gentleman, he deſerves.

Adieu.

LET-

LETTER XIX.

YOU have aſked me a queſtion, to which it is as difficult to give you a poſitive anſwer, as to any query that ever went to Delphi; and, in imitation of that wiſe Oracle, my opinion ſhall be ſuch, that it may become negative or affirmative, according to circumſtances.

To learn, or not to learn, Muſic? that is the queſtion. I have a great deal to ſay upon this ſubject; you muſt therefore prepare yourſelf for a prolix epiſtle. If you happen to be deeply engaged in ſtudies of more importance, you may poſtpone the peruſal, till you have more leiſure: there is nothing ſo *ſpiritual* in the matter as to cauſe it to evaporate.

By *learning Muſic*, I ſuppoſe you mean learning to play upon ſome muſical inſtrument. This may ſeem a captious diſtinction; but an habitual accuracy of expreſſion will gradually induce preciſion in thinking. There is indeed a very material difference between learning Muſic, that is, learning the Science of Muſic, and learning to play

upon an inſtrument. The exerciſes required of one who ſits for the degree of Doctor in Muſic, are compoſitions, not manual performance; and there are many excellent *hands* who are totally ignorant of Muſic.

I am particular, perhaps pedantic, upon this ſubject, becauſe it is that concerning which people in general, (thoſe who are not, in ſome degree, *initiated)* ſpeak moſt *illiterately*, if I may be allowed the expreſſion. Even the common words *harmony* and *melody* are perpetually miſapplied by perſons who know nothing of Muſic: nor is there, in this, any juſt cauſe of ſurpriſe, when we find that our beſt Lexicographers were ignorant of the diſtinction. That Coloſſus in literature, Dr. Johnſon, explains the word *Melody* by *harmony* of ſound. It is of Greek derivation; or rather it is a Greek word, μελωδια, and when applied to Muſic could never mean *harmony*, of which the Greeks had no idea. *Harmony* (ἁρμονια, concord, from αρω, *apto*,) is a word that cannot be properly applied to Muſic, but to expreſs the effect of two, three, or four notes, or tones, vibrating or ſounding at the ſame time. *Melody*, on the contrary, expreſſes an agreeable ſucceſſion of ſingle tones, ſuch as may be executed

executed by a voice or a flute, or by any other wind-inſtrument. Stringed inſtruments are capable of producing harmony, becauſe two or more notes may be ſtruck at the ſame inſtant.

It is not uncommon, when young gentlemen or young ladies who have learnt to play a little, are ſtanding behind a performer, to hear them ſay — "O, that piece is in a *ſharp*, or in a *flat* key" — judging from there being *flats*, or *ſharps*, marked at the beginning of the movement. Now, it is an equal chance that they are wrong: it depends on circumſtances, of which they are totally ignorant; but which are known by a muſician the moment he hears the firſt *chord* ſtruck by the inſtruments. I ſhall explain this hereafter.

But nothing is more ridiculous than to hear the audience at a Concert vociferate their applauſe, in a foreign language, of which they do not underſtand a word. Whether the ſinger be male or female; whether it be *one* performer, *two* performers, or a *chorus*, they mean to applaud, the cry is always *bravo!* What muſt an Italian female think of an Engliſh audience, who thus

compliment her, as if ſhe were a man? or when they thus expreſs their approbation of a *duetto*, as if it were ſung by an individual? I do not expect that every gentleman or lady who is preſent at a Concert or an Opera, ſhould underſtand Italian; but ſurely it were prudent not to riſk the uſe of words in public exclamation, until we know their meaning.

Catches and *Glees* are much in vogue, and are conſequently frequent ſubjects of converſation, yet there are few people, totally ignorant of Muſic, who do not want to be told, that they differ materially in their conſtruction; that in a *Catch*, the three voices take the parts alternately, ſo that each voice ſings the whole in turn: but that in a *Glee*, all the voices begin at the ſame time and ſing different parts, from firſt to laſt.

Now, though all this may be conſidered as knowledge of little importance, yet it is ſo eaſily acquired, and indeed ſo neceſſary to thoſe that mix with muſical people, that no gentleman ſhould be without it. This ſort of knowledge is ſufficient for the generality; but a man of ſcience ſhould know more. He may be ignorant of Muſic as an

Art;

Art; but, as a Science, he ought not to be unacquainted with its foundation, its eſſence, its conſtitution.

All muſical ſounds, whether of bells, of organ-pipes, of flutes, harpſichords, violins, &c. are produced by vibrations in the parts of theſe inſtruments, excited by ſome external cauſe. Theſe vibrations cauſe ſimilar undulations in the air, which ſtriking on our organs of hearing, brings, from the inſtrument, that vibration which excites in us the idea of the tone produced. Theſe inviſible undulations in the air, have, not unaptly, been compared to the waves ſuddenly produced on a ſmooth body of water, by a ſtone thrown into it: theſe waves are ſeen to expand, in all directions, in concentric circles from the ſpot where the ſtone fell. Sound, in like manner, expands in every direction, and the extent of its progreſs is in proportion to the impulſe on the vibrating cord or bell.

Admitting this theory, if every identical tone excite a peculiar undulation in the air, how happens it, that the various undulations produced by a rapid ſucceſſion of tones, do not perplex and deſtroy each other?—If you throw a ſtone into a fiſh-pond, and, imme-

immediately after, another, and then a third, if you look very attentively, you will perceive, that their reſpective circles will proceed without interruption, and ſtrike the ſhore in regular ſucceſſion. This experiment may be more ſatisfactorily made, on your table, in a large trough of Quickſilver. If you ſtrike the ſurface at one end, with your finger, and then immediately at the other, you will ſee the waves of each run to the oppoſite extremity of the trough, paſſing each other without producing any confuſion or interruption. This by way of illuſtration; but ſurely the fact is a ſufficient demonſtration, that the atmoſphere poſſeſſes the faculty of conveying ſounds in the moſt rapid ſucceſſion, or combination, as diſtinctly as they were produced. It poſſeſſes the power not only of receiving and propagating ſimple and compound vibrations in direct lines from the voice or inſtrument; but of retaining and communicating ſounds with equal fidelity, after repeated reflections and reverberation, as you have often been convinced by the ſound of French-horns among the hills. I ſhall purſue the ſubject in my next letter: till then, farewel.

LET-

LETTER XX.

HAVING, in my laſt letter, accounted for the production and propagation of muſical ſounds, the next natural queſtion is—What is the cauſe of *high* and *low*—or, to ſpeak more muſically, of *grave* and *acute* ſounds or tones?—Theſe depend on the quick or ſlow vibrations of the ſounding body; that is, on the greater or leſs number of vibrations, in a given time. Large inſtruments and long ſtrings, produce grave or deep tones; ſmall inſtruments and ſhort ſtrings, on the contrary, produce acute or high tones; in organ-pipes, for example, in proportion to their length and dimenſions: this is alſo true of muſical ſtrings. If I take a muſical ſtring of any length, and divide it into two equal parts by a bridge in the middle, each half ſounds an octave, (that is, eight notes) higher than the tone of the whole ſtring. Their vibrations, relative to the whole ſtring, are as 2 to 1: therefore, they perform the ſame number of vibrations in half the time; and conſequently the octave

tave coincides with the fundamental note only at every ſecond vibration.

But you will now aſk, how it happens, as theſe vibrations gradually ceaſe, that the tone continues the ſame, till it is heard no more? It were natural to ſuppoſe, as the acuteneſs of the ſound depends on the celerity of the vibrations, that as they become ſlower towards their decline, the tone would grow deeper, or more grave. If it were true that they vibrate gradually ſlower, the objection would be unanſwerable. But the fact is otherwiſe. As a pendulum performs all its oſcillations in equal times; its greateſt range in the ſame time as its leaſt; ſo a muſical ſtring makes its firſt long vibration in the ſame time as its laſt ſhort one; for this reaſon, the tone is uniformly the ſame from firſt to laſt.

In proof of what I have ſaid concerning the length of ſtrings, you obſerve, that the ſtrings, of this harpſichord, which make the high notes are the ſhorteſt, and that they gradually increaſe in length as you deſcend to the deepeſt note of the inſtrument. Now though there be black and white keys on this harpſichord, and each of theſe ſtrike a dif-

different note, yet the real number of notes is no more than ſeven, which are called by the firſt ſeven letters of the alphabet. If you begin with A, and ſtrike ſeven notes in ſucceſſion upwards or downwards, you will, either way, come again to A: they are not indeed the ſame notes as that with which you began; but they are octaves to it, vibrating, the one in half, the other in double the time.

Theſe ſeven notes are thoſe of a peal of ſeven bells: when there are eight, the ſmalleſt bell is an octave to the largeſt. But if muſical inſtruments contained no other than theſe ſeven notes and their octaves, they would produce no better melody than that wretched jumble of ſounds called ringing changes; or, at beſt, but a very ſimple tune: therefore to render theſe inſtruments more comprehenſive, intermediate notes, called ſemitones, were introduced, each half a tone higher than the note below it, and conſequently half a tone lower than the note above. Theſe are the ſhort white keys on the harpſichord. In conſequence of this arrangement, the whole octave conſiſts of 12 ſemitones, for they are each half a tone higher or lower than the next.

But,

But, you will aſk—if there be ſeven whole notes, and if there be a ſemitone between every two, why does not the ſcale conſiſt of 14 ſemitones?—This is a very natural queſtion.

The reaſon, why there are but five intermediate notes, is, that, in this natural ſcale, there are two places which require none; the two notes, between which theſe intervals lie, being only half a tone aſunder. Why it is ſo, I know not; but, you may immediately convince yourſelf, that it is a law in Nature, which your ear compels you to obey. Sing eight ſucceſſive notes, from the loweſt to the higheſt, or the reverſe, like a peal of eight bells when they ring *round*, as they call it, and you will, without knowing it, make an interval of but half a tone in two different places, namely, between the 3d and 4th, and between the 7th and 8th notes of the ſcale: thus 1—2—34—5—6—78. But theſe half-intervals are not abſolutely confined to the places where you ſee them in this example: the ear will bear them in the following poſition, 1—23—4—56—7—8. In this laſt ſeries, you obſerve, the half tones lie between the 2d and 3d; 5th and 6th. Now, if you dot theſe notes

with

with one finger on the harpſichord, beginning with A, and touch none of the ſhort keys, you will find, after a few repetitions, not only that the ear will bear it; but, that there is a mildneſs, a ſwavity, in the effect when contraſted with the firſt *modus*. I ſay *modus*, for they are the ſame *diatonic* ſcale, conſiſting of the ſame number of ſemitones. It is called the Diatonic ſcale to diſtinguiſh it from the Chromatic, which aſcends and deſcends by half tones, and which being artfully mixed with the other, produces the various modulations in modern compoſitions. The ancients, we are told had other ſcales, in which their tones were more minutely ſubdivided. Our ſcience of Muſic requires no ſuch ſubtilties.

The firſt of theſe modes is the *ſharp*, or *major*, the ſecond, the *flat*, or *minor* key; for there are no more than two *keys*, or, more properly, *modes*; and theſe, be the fundamental, or key-note, what it may, are always determined by the *third* being *flat* or *ſharp*; or, in other words, by the interval of half a tone lying between the ſecond and third, or between the third and fourth note of the ſcale. There is one thing more to be obſerved of this *flat* key, namely, that if

you

you begin with C, the flat 3d, the ſemitones will occur in the ſame order as in the firſt *modus*. You will obſerve that any of theſe notes or half-notes, on the harpſichord, may be made the fundamental or firſt note of the ſcale in either *modus*; which note gives name to the key in which you modulate, and with which you muſt neceſſarily conclude the piece: But whatſoever note you make the key-note, the ſemitone-intervals muſt fall in their proper places; and this can be attended with no difficulty, as the inſtrument conſiſts entirely of ſemitones. But, before we try the experiment, it is neceſſary you ſhould know, that every ſemitone takes, occaſionally, either the name of the note above or of that below it: thus, this half note between G and A is G *ſharp*, that is, half a tone higher than the natural G; or it is A *flat*, that is, half a tone lower than the natural A.

If now you begin with C, and proceed upwards, note by note, you find the ſemitone-intervals lie in their proper places, namely, between the 3d and 4th, and between the 7th and 8th, without the neceſſity of introducing any of the ſhort black keys. But if you now make D your fundamental

damental note, in order to make two ſemitones, according to the major key, between the ſecond and third note in the ſcale, you are under a neceſſity of taking the F *ſharp*; and, when you come up to C, the ſame neceſſity recurs, becauſe there muſt be a whole tone between the 6th and the 7th, and but half a tone between the 7th and the octave. For theſe reaſons, when a piece of Muſic is compoſed in D with a *major* third, there is a double croſs prefixt on or between the lines where F and C are pricked, ſignifying that theſe two notes are *ſharp*. If on the contrary, you make B *flat* your fundamental note, and proceed upwards in the major key, you will find yourſelf obliged in order to make the ſemitones fall between the 3d and 4th and 7th and 8th as before, to take in E *flat*: ſo that B and E muſt be marked flat at the beginning of the movement: nevertheleſs, this movement has a ſharp third, and is conſequently in the major key. But if, with the ſame fundamental note, you change the ſemitone-intervals, according to the minor *modus*, then A, B, D, E and G, will be *flat*. Flats are marked by a ſmall *b*, as the ſharps are by a double croſs.

You hear Muſicians talk of *Cliffs* and of

Time, *triple* and *common*. That their language may not be totally unintelligible to you, I will give you ſuch information, as, I think, every gentleman, liberally educated, ſhould poſſeſs.

Muſical notes are written or engraved, on or between five fundamental lines, to which there are occaſionally added one or two more in the writing or engraving. Now, in order to avoid the obvious inconveniency of adding too many of theſe occaſional lines, *Cliffs* were invented, by which any particular line, or interval, may be made the place of any note in the ſcale: if, for example, I make the place of G the loweſt line but one, as in the common *Triple Cliff*, then the note in the interval above will be A, and that in the interval below will be F, and ſo of the reſt. But if I make the upper line but one, F, as in the *Baſs Cliff*, then the interval above will be G, and the interval below will be E. There are other Cliffs to anſwer the ſame intention; but this is ſufficient to explain the deſign and conveniency of this arbitrary method of fixing a particular note on any line or interval.

Many years ago, I had the pleaſure of being acquainted with a Mr. Roebuck of Heath,

Heath, near Wakefield in Yorkſhire, a gentleman of fortune and a *gentleman*-fidler: by a *gentleman*-fidler, I mean a ſcraper; for ſuch, gentlemen fidlers generally are. "Damn it," he would ſay, "thoſe raſcally compoſers invented theſe Cliffs on purpoſe to puzzle gentlemen."—I do not, with Mr. Roebuck, believe that they were invented with that intention; for they are frequently of indiſpenſible neceſſity; but they are often introduced, particularly in the Muſic of the laſt age, when there is not the leaſt occaſion for them. The wanton introduction of various Cliffs is certainly wrong. I ſhall tell you ſomething about *Time* in my next letter.

Adieu.

LETTER XXI.

TIME, abſtractedly conſidered, independant of viſible motion, is leſs difficult to conceive than to explain or define. The Ariſtotelians made ſad nonſenſe of their definition of Time—*numerus motus ſecundum prius et poſterius.* But though we cannot eaſily explain our idea of abſolute Time, what we mean by relative Time, may be communicated with great facility. The annual and diurnal motions of the Earth are performed in certain fixed portions of abſolute Time: theſe portions therefore may be divided and ſubdivided into months, weeks, days, hours, minutes and ſeconds; which ſeconds are diſtinctly marked by the ſwing of a pendulum of a certain length. Some attempts have been made to apply theſe regular oſcillations of pendulums to muſical Time, ſo as to determine the abſolute duration or length of each note. It was an idle project, becauſe it were uſeleſs and impracticable.

Muſical Time is merely relative, and muſt always be arbitrary. It depends on the fluc-

fluctuating taſte of the age, and on the executive powers of the performer. In the modern ſtyle of performance, a *preſto* movement muſt be played with the rapidity of lightning.

There are, in Muſic, but two kinds of Time. One is called *Common*, the other *Triple* Time. In the firſt, when the notes in a bar are of equal length, the number is even; in the ſecond, it is odd. By a *Bar* is underſtood the ſpace between any two of thoſe perpendicular lines drawn acroſs the five lines ruled upon the paper. Let us ſuppoſe the following figures to be notes. 1234, 1234, 1234, &c. Now, if you ſing theſe four figures to any tune you pleaſe, and beat with your hand or foot whenever you come to the 1, you will ſing in common time. If now you change your melody to *three* figures, thus—123, 123, 123, and beat as before, you ſing in triple Time. A few repetitions of this very ſimple practice, will, in five minutes, teach you that which many young ladies do not comprehend, after ſeven years inſtruction. The fault is in the Maſter.

As to the length, continuance, duration, or protraction of each ſpecies of notes, the ſcholar is unneceſſarily perplexed by a num-

ber of unmeaning names, ſuch as *breves*, *ſemibreves*, *crotchets*, *quavers*, *ſemiquavers*, &c. It were much more rational, becauſe more intelligible, to call the ſimple open circle, a *note*; when it has a tail, a *half-note*; when the head is filled, a *quarter-note*; when the tails are once tyed, an *eighth*; twice, a *ſixteenth*, &c. Thus the name would expreſs the relative proportion of every note, and any farther explanation would be unneceſſary.

So much for Scale, Mode, Key, Cliff, and Time. I told you, in a former letter, that modern Muſic differs eſſentially from that of the ancients, in the invention of *Harmony*, of which they appear to have been totally ignorant. I alſo told you that Harmony is the effect of two or more tones ſounding at the ſame time. You will now aſk, what is this Harmony?—and which are the tones that produce the effect?

Muſical Harmony has its foundation in a law of Nature: or, in other language, in a certain property inherent in peculiar modifications of matter: it depends on a coincidence in the vibrations of the ſounding bodies. No two ſtrings vibrate in equal times, unleſs they be turned in exact uniſon,

as

as are the two wires on a harpſichord, which form each individual note. I ſpeak of a harpſichord without octaves. Uniſon therefore is the only perfect concord. Other chords are more or leſs perfect as their vibrations coincide more or leſs frequently.

The next chord in degree of Harmony is the Octave, becauſe, as it vibrates in *half*, or in *double*, the time, the tones coincide at every ſecond vibration. The Octave, you remember, is the tone of a ſtring half the length: that is, the tone on each ſide of the bridge, of a ſtring divided into two equal parts. Now, if I remove the bridge, ſo as to leave three parts of the whole ſtring on one ſide, and two on the other, the longeſt diviſion will ſound a 5th to the whole ſtring, and if they were ſounded together, there would be a perfect coincidence at every third vibration: the 5th therefore is the next chord in rank.—You now move the bridge, ſo that there ſhall be three fourths on one ſide; this longer part will ſound a fourth to the whole ſtring, and their vibrations will unite at every fourth return. You then move the bridge ſo as to leave four 5ths on one ſide: the longeſt diviſion will ſound a major third to the open ſtring, and the vibrations of

two ſtrings in this proportion, will coincide at every 5th repetition. — And ſo of other concords. Diſcords are the tones whoſe vibrations never coincide. They are nevertheleſs of indiſpenſible uſe in Muſic as a foil, and as the means of introducing concords with advantage.

In writing all this, I have not the moſt diſtant intention to make a Compoſer of you. It is the philoſophical part only of Muſic, which I have endeavoured to explain; that part which every philoſopher (I ſuppoſe you intend to be a philoſopher) ſhould know, and which may be perfectly underſtood without being able to play a note on any inſtrument.

I mean now to conſider your queſtion — "Whether I would adviſe you to learn to play, and on what inſtrument?" — From the following reflections you will collect my opinion of this matter.

The practice of Muſic, is, doubtleſs, an innocent and delightful amuſement; and, becauſe it is delightful, very improper for thoſe who have no time to ſpare. But, ſay the advocates for Muſic, it is a better relaxation and relief from ſtudy, than mere idleneſs. There are two anſwers to this plea: firſt,

firſt, ſtudious men require, in their relaxations, air and exerciſe — Muſic affords neither: ſecondly, it has often happened, that this relief which was at firſt admitted as a handmaid to Study, became her miſtreſs: nay, the baggage has ſometimes been ſo inſolent as to turn her miſtreſs out of doors.

When I firſt began to ſcrape on the violin, I was told, by my maſter, that unleſs I determined to practiſe eight hours every day, it was in vain to begin: yet people learn Muſic for amuſement; an amuſement that is conſtantly to occupy a third part of their whole time. There is indeed no art that requires more conſtant labour, if you have the ambition to excel; to excel, I mean, as a *gentleman performer*; for you will never advance higher than a humble *Repiano* in a good band. Now, whether the proſpect of arriving at this degree of excellence, deſerve the ſacrifice of one third of your time, admits of ſome doubt.

If we reflect, that, from the beginning of this century to the preſent time, many thouſands of men, in this kingdom, have been labouring inceſſantly to attain the art of playing on the Violin, ſome for amuſement and

and others in their *vocation*; and that we have not yet produced one firſt-rate player; is there not reaſon to conclude, either, that it is infinitely the moſt difficult of all arts, or that there is ſome *ſecret*, induſtriouſly concealed from Engliſhmen. Probably there is no ſecret in the caſe; but there is a very unaccountable want of obſervation and reflection, viſible in the *execution* of almoſt all our violin-players.

When a boy firſt begins to ſcrape his gamut on the fiddle, he naturally makes every note by the motion of his whole right arm from the ſhoulder. After he has practiſed for ſome time, he acquires, from neceſſity, a little motion in the elbow, and with this he reſts perfectly ſatisfied. The proper motion of his wriſt, if he underſtood it ever ſo well, would be incompetent to the execution of quick paſſages, becauſe he plays with that part of his bow which lies between the centre and the farther extremity; conſequently when the notes are to be played on different ſtrings, the arch deſcribed by the right hand, extends beyond the power of the wriſt; therefore the motion muſt neceſſarily begin at the elbow, if not higher.

As

As this is a mechanical operation, if the propoſition be true, it may be mathematically demonſtrated: thus —

The part of the bow, in contact with the ſtring of the violin, is the centre of a circle, of which the hair of the bow, from that centre to the extremity of the little finger on the right hand, is the *radius*; conſequently this little finger moves in the circumference of a circle, which is greater or leſs, according to the length of that *radius*; and, as the length of the arch to be deſcribed, in the ſame time, depends on the magnitude of the circle, it is evident that an artiſt who executes difficult quick paſſages with the part of the fiddle-ſtick neareſt his hand, will, *ceteris paribus*, execute thoſe paſſages with the greateſt eaſe. Let us ſuppoſe the bow to be divided into four equal parts: the hand of the artiſt who plays quick paſſages on the firſt, diſtant diviſion, deſcribes, we will ſuppoſe, 20 archs of his circle, or plays twenty *quarter-notes* on different ſtrings in a ſecond of time: if he played with the centre on the ſecond diviſion of his bow, he would execute 20 *eighths*, and on the third, 20 *ſixteenths*, in the ſame time. But this is not the only advantage of playing near the hand; it brings the

the execution within the range of the wriſt, without any aſſiſtance from the arm.

There is yet another eſſential difference between a common player and a capital artiſt: it lies in expreſſion; which the firſt endeavours to produce by the occaſional preſſure of his whole hand and arm; whilſt, in the latter, it is entirely the effect of the fingers, not of the *left*, but of the *right* hand. His expreſſive ideas do not ſtop at his elbow, nor yet at his wriſt: they paſs immediately to his fingers, like the feelings of a fine performer on the *Piano-forte*.

If now you obſerve, with attention, Cramer's manner, and compare it with that of the fidlers about him, you will eaſily conceive it impoſſible for theſe gentlemen ever to paſs the line of mediocrity. But this perfect and indiſpenſible knowledge of the principles of the art, is not, of itſelf, ſufficient to produce a capital performer on the violin. Nature muſt previouſly have favoured the individual with a genius or talent for Muſic; with an ear exquiſitely formed, and capable of the moſt minute diſcrimination of ſounds.

Inſtruments on which principal parts are played in Concerts, and which conſequently require

require rapid execution, muſt be begun with at a very early age, and the practice continued with a degree of aſſiduity, juſtifiable only in a profeſſed Muſician. But if you have a tolerable ear, are fond of harmony, and wiſh to be able to take a ſimple part in a private Concert, the Tenor-fiddle, the Violoncello, or the Baſſoon, may be learnt in a ſhort time, and retained by very moderate practice. If your ambition ſoar no higher than a Scotch ballad, the German flute is your inſtrument. By all means, avoid the Hautboy, out of compaſſion for your neighbours; unleſs, at any time, you want to drive the rats and mice from your apartment. As to the Harpſichord — I once ſat playing upon that inſtrument, in a room next the ſquare where I then lived. As two gentlemen were paſſing the window, I heard one of them exclaim, — "I hate to ſee *a man* at the Harpſichord!" I had never before annexed the idea of effeminacy to that inſtrument; but from that moment, I began to be of the gentleman's opinion.

I think, the moſt deſirable muſical accompliſhment, is, the art of ſinging at ſight; that is, the art of hitting, or ſounding the notes with your voice as with an inſtrument.

ment. Poſſeſſed of this art, with a proper comprehenſion of time, you are, without being a profeſſed ſinger, enabled to join in a Catch or Glee, which, of all Muſic, is the moſt generally pleaſing.

But, this art is commonly thought difficult to learn. I believe the difficulty originates in the abſurd method of teaching. If you have voice and ear ſufficiently true to run the octave up and down, both in the major and minor key, you may, by the following ſimple means, learn to ſing at ſight in leſs than a fortnight; provided you have, previouſly, a ſufficient knowledge of *triple* and *common* Time, and of the relative length of the notes and reſts: a knowledge that may be acquired in an hour.

For the letters of the alphabet, by which the ſeven notes are named, I ſubſtitute the ſeven firſt figures, 1, 2, 3, &c. becauſe they will apply to any part of the harpſichord: begin where you pleaſe, 1 is the fundamental, or key-note, 2 the ſecond, 3 the third, and ſo on to the octave.

Firſt, run the ſeven notes, in the major key, from one octave to the other, backward and forward, till you can ſound them truly and eaſily. Then practiſe the ſame in the minor

minor key, and, if you be not perfectly ſure of the truth of your ear, touch the notes on the harpſichord as often as you are in doubt.

Having thus made ſure of the notes in their natural order, in both modes, you may now proceed to ring changes on them thus. 1, 3, 5, 7; 7, 5, 3, 1.—then 1, 4, 6, 8; 8, 6, 4, 1: continuing to alternate theſe chords till you have them quite perfect. You may now take them in the following order: 1, 2; 1, 3; 1, 4; 1, 5; 1, 6; 1, 7; 1, 8;—then, 8, 7; 8, 6; 8, 5; 8, 4; 8, 3; 8, 2; 8, 1. When you are quite perfect in this third leſſon, both major and minor, your fourth leſſon may be in this progreſſion—1, 3; 2, 4; 3, 5; 4, 6; 5, 7; 6, 8: then 8, 6; 7, 5; 6, 4; 5, 3; 4, 2; 3, 1. Preſuming that you can ſing theſe four leſſons with great eaſe and certainty, you may proceed to the chromatic ſcale, riſing by half-notes from the lower to the upper octave, and deſcending in the ſame manner; and now the great buſineſs is over. Take a ſong, or any book of Muſic; pitch your key, and you will find, that, with a little practice, you will be able to hit the notes as certainly as with an inſtrument.

It was a very juſt obſervation of my worthy acquaintance Dr. J—— who is himſelf a good

a good Muſician and an excellent ſinger, that ſinging has this great advantage over inſtruments, the learner may practiſe whenever he is alone, walking or riding; ſo that there is no loſs of time; whilſt one of the ſtrongeſt objections to the practice of inſtrumental Muſic is, that it requires more time than a ſtudious young man can ſpare.

Vale.

LET-

LETTER XXII.

A MIND, naturally inquiſitive, one would imagine, muſt feel diſſatisfied in a ſtate of total ignorance, relative to the ſurface of this terreſtrial globe. The greateſt number of mankind know nothing more of the planet they inhabit, than the town or pariſh in which they were born. A ſchool-boy, from a public ſeminary, is as ignorant of Geography as a peaſant, and the ſyſtem of education at the Univerſities is not calculated to inculcate Geographical information.

There are, I believe, very few young gentlemen, who do not feel depreſſed by this load of geographical ignorance. Every Newſpaper is an *opprobrium.* They read the names of towns and countries without knowing in what quarter of the world they are to be found; and they are afraid to aſk queſtions, which, they know, ſome children could anſwer. They have ſeen Geographical Grammars; but theſe are ſuch thick cloſe-printed volumes, and ſeem to contain ſuch a multifarious accumulation of ſcience

and technical language, that they poſtpone the ſtudy of Geography, till they have at leaſt ſix months to ſpare. Probably you will be ſurpriſed when I aver, that all the Geography neceſſary to a gentleman and a polite ſcholar, may be taught in the compaſs of a very few pages; perhaps within the limits of a moderate letter, or two.

What is the ſcience of Geography? Its derivation from γη *terra* and γραφω *ſcribo*, anſwers the queſtion. It is then, a deſcription of the Earth; a knowledge of the abſolute and relative ſituations of empires, kingdoms, provinces, &c. It is generally made to include, *the uſe of the globes*, but improperly. Conſidering the Earth as a globe, making a part of the ſolar ſyſtem, it becomes an object of Aſtronomy. Geography is no farther concerned in the Earth's motion, and dependence on other bodies, than as they affect the various climates on its ſurface. This ſcience therefore may be ſtudied with equal propriety, and much more conveniency, in the maps which cover the walls of this room, than on a terreſtrial globe.

Let us begin with that in the centre: the map of the World. It conſiſts, you perceive,

of

of two large circles, which repreſent the two hemiſpheres of the globe, ſuppoſing it cut into two equal parts. The broad external circles which ſurround theſe two hemiſpheres repreſent the horizon; that is, the imaginary circular line, which, if you were raiſed ſo far above the Earth as to ſee one half of it, would divide the viſible from the inviſible half.

That ſtraight horizontal line which divides the northern from the ſouthern hemiſphere, is called the *Equator:* on the Earth it is an imaginary, and, on a globe, a real circle. The double circle which paſſes over the middle of New Holland, and that which you ſee at the ſame diſtance from the Equator on the north ſide, are called the *Tropics.* The other two double circles near the north and ſouth poles, are the *Polar Circles.* They are of uſe in Geography in determining what are called the Zones. The ſpace between the two Tropics is the *torrid*; between thoſe and the polar circles, the *temperate*, and within thoſe circles, the *frigid* Zones.

In this, and in all other maps, the top is the *north*; the bottom, the *ſouth*; your right hand, the *eaſt*; and your left, the *weſt.*

Thoſe circles, which you ſee meet in both

poles, are called *Meridians*. They paſs through every tenth degree of the Equator, and ſerve to mark the longitude: they are imaginary circles which would be formed by a line drawn upon the Earth over the ſpot to which the ſun is vertical at every tenth degree. The curve lines which are drawn from every tenth degree on the Horizon, ſerve to mark the latitude. By *latitude* is meant the diſtance from the Equator north and ſouth. *Longitude* is the diſtance, eaſt or weſt, from any particular Meridian: in our maps, it is generally taken from that of the Obſervatory at Greenwich.

You know, our firſt great diviſion of the Earth is into what are called four quarters: Europe, Aſia, Africa and America. Theſe we will ſucceſſively contemplate. But before we take our leave of this general map of the World, it is neceſſary that you ſhould particularly notice the ſituation of theſe four quarters relative to each other. The northern hemiſphere, you ſee, is occupied by Europe, Aſia, the greateſt part of Africa, and North America. In the ſouthern, we find no land except South America, part of Africa, New Holland, and a conſiderable number of iſlands in the Pacific Ocean.

Our

Our conſtant intercourſe with the Eaſt Indies renders an acquaintance with the ſituation of that country indiſpenſibly neceſſary. You read of ſhips making their outward or homeward voyage in ſix, ſeven, eight months, &c.; they touched at the Cape of Good Hope; they watered at St. Helena. Now, is it conceivable that a young gentleman poſſeſſed of any curioſity, or the leaſt inclination to knowledge, can reſt ſatisfied in the total ignorance of the diſtance and ſituation of places which affront him in every news-paper. The Cape is the ſouth extremity of Africa, and the ſmall iſland of St. Helena, you will find, in about ſix degrees of weſt longitude and fifteen of ſouth latitude. Other remarkable places are New Holland, on the ſouth-eaſt coaſt of which you will find Botany Bay, &c. and on the weſt coaſt of North America, in latitude 50, you will lay your finger on *Nootka Sound*, the preſent bone of contention between us and Spain. Before you quit this map, you will alſo take notice that the ſea between Europe and North America, is called the *Atlantic*; that between America and the eaſtern coaſt of Aſia, the *Pacific Ocean*; and

that which occupies the greateſt part of the ſouthern hemiſphere, the *South Seas*.

Having thus diſpatched the world in general, let us now contemplate this map of Europe; which, you perceive, is the Europe we have already ſeen, magnified, or delineated on a larger ſcale. Here the degrees of *latitude* marked on the ſides, and of longitude at the bottom, are much larger. By this means Europe becomes as large as the whole world; and, as theſe degrees may be enlarged to any ſize, a kingdom may be magnified to appear as large as this Europe, or a province as large as a kingdom.

Before we inveſtigate this quarter of the world, it is neceſſary to obſerve by what countries and ſeas it is environed. On the *eaſt* you ſee it is bounded by Aſia; on the *weſt*, by the Atlantic; on the *north*, by the Frozen Sea; and on the *ſouth*, by the Mediterranean. This ſea, you obſerve, is a principal object: it deſerves your attentive conſideration. It waſhes the coaſt of Spain, of France, of Italy, and of European Turkey. It contains the iſlands of Ivica, Majorca, Minorca, Corſica, Sardinia, Sicily, Candia and Cyprus, beſides the ſmall iſlands of the Archipelago,

chipelago, and others in the gulph of Venice. If you apply your compaſſes to that ſcale of Engliſh miles, and then ſtride them from one end to the other of the Mediterranean ſea, you will find it about 2000 miles in length. With your compaſſes thus fixed, you can inſtantly meaſure any of the kingdoms, or ſtates, in this map, or the diſtance between any two places.

The map being coloured, you immediately perceive the ſize and ſituation of the ſeveral kingdoms, &c. You obſerve the prodigious extent of the Ruſſian Empire, and the remainder you will find covers an equal proportion of Aſia. Sweden, though not very powerful, is next in ſize. France, Spain, Germany, Poland, Denmark and Norway, Turkey, England and Ireland, Italy and its appendages, differ not materially in dimenſions. The ſmall States and Kingdoms are, Holland, Switzerland, Portugal and Pruſſia; but you are not to eſtimate the territories of his Pruſſian Majeſty, by the ſize of his *kingdom*. He is, beſides, Elector of Brandenburgh in Germany, where you will find his capital, Berlin. To theſe the great Frederick added Sileſia, which he took from the Empreſs, and obtained a conſiderable ſlice

of Poland, in a late partition between the two Empreſſes and himſelf.

You may ſometimes, in converſation, wiſh to recollect the latitde of the principal cities in Europe. The beſt method of fixing this in your memory, is to trace, with your finger thoſe that lie in, or near, the ſame parallel, thus: Beginning with the latitude 41, on the weſt ſide of the map, and paſſing a little above the line 40, you will firſt touch upon Oporto in Portugal; thence, travelling eaſtward, you will paſs through Madrid the capital of Spain; thence, over the iſland of Sardinia, to Naples in Italy: and thence to Conſtantinople. Theſe cities therefore lie in, or very near, the ſame degree of latitude, and therefore enjoy the ſame climate, except what differences may ariſe from local circumſtances.

If now you move your finger up to 48, and proceed eaſtward, as before, you will paſs through Paris, Manheim, Ratiſbon, near Vienna, Preſbourg, through the upper part of Hungary and the ſouthern extremity of Ruſſia. About the latitude 52 you will find London, Amſterdam, Brunſwick, Berlin, Warſaw. In 56, paſſing from weſt to eaſt, on the ſame parallel, you will travel through

through Edinburgh to Copenhagen, and thence to Moſcow. Peterſburgh, the capital of the Ruſſian Empire, lies in 60, the latitude of the Shetland iſlands.

In this map of Europe it is neceſſary farther to remark, that, beſides the Mediterranean, there are two other inland ſeas, viz. the Baltic and the Black Sea. The firſt, you obſerve, communicates with the German Ocean through the Categate, and the other with the Mediterranean, by the Archipelago. On the coaſt of the Baltic there are ſeveral towns which deſerve particular notice, as you find them frequently mentioned in the public accounts of the progreſs of the preſent war between Sweden and Ruſſia. The ports on the Black Sea alſo merit your attention on account of the war between the Ruſſians and the Turks. For the ſame reaſon you ſhould mark the ſituation of the principal towns on the borders of Turkey.

There remains nothing more, I think, of any importance, except the principal rivers, viz.—The Volga, which riſes in Moſcovy and falls into the Caſpian Sea at Aſtrachan—The Don, whoſe ſource is not far from that of the Volga, but which runs to the Sea of Aſoph — The Danube and the Rhine, both which

which take their riſe in or very near Switzerland. The firſt takes an eaſtern courſe, and, after paſſing, as you ſee, through Germany, Hungary, and Turkey, falls into the Black Sea: the Rhine takes a contrary direction, runs through Germany and Holland, and diſembogues itſelf in the German Ocean. Rivers of leſs note are the Elbe at Hambourgh, the Tagus at Liſbon, the Thames at London, and the Rhone in France, which laſt, you obſerve, falls into the Gulph of Lyons near Marſeilles.

As to our iſland, you ſee it lies between 50 and 60 degrees of north latitude, that, on the *eaſt*, it is ſeparated from the Continent by the German Ocean; on the *weſt*, from Ireland, by St. George's Channel; and on the *ſouth*, from France, by the Engliſh Channel.

Vale.

LET-

LETTER XXIII.

WE now turn our attention to the map of Aſia, in which, as in that of Europe, you ſee, the Ruſſian dominions cover the largeſt ſpace. In this vaſt territory, there are few objects worth remembering, except Kamtſchatka, which is mentioned by ſome of our northern navigators, and that inhoſpitable region, called Siberia, to which Ruſſian malefactors are baniſhed. The firſt of theſe lies between 55 and 60, the latitude of Scotland.

With Tartary we have no concern: with Arabia and Perſia, almoſt as little. In Turkey, which is at the weſtern extremity of the map, you find Smyrna and Aleppo at the eaſt end of the Mediterranean. Theſe places are well known to our merchants trading to Turkey. You there alſo find Jeruſalem and other towns mentioned in ſcripture.

Thence we proceed to India, and tracing the coaſt from Surat on the weſt ſide to the mouths of the Ganges at the eaſtern extremity, you paſs in ſucceſſion, Bombay, Goa, and thence along the coaſts of the Carnatic,

Malabar, and Coromandel, till you come to Pondicherry, Madras, and ſo on to Calcutta. Hence, paſſing to the ſouth of the Equator, we ſail between the iſlands of Sumatra, and Java; leaving the Dutch ſettlement of Batavia on the right, we proceed directly north to Canton in China, and thence to Pekin at the northern extremity of that empire. All theſe are places with the names of which you have been long acquainted, and whoſe reſpective ſituations, I dare ſay, you will now remember. The ſeveral cluſters of iſlands in this map, are thoſe of Japan, of Sonda, the Philippins, the Ladrones, the Moluccas or Spice-iſlands and the Moldivias. That part of India with which we have any connection, lies, you obſerve, within the Tropic; that is, within 23 degrees and a half of the Equator: conſequently the inhabitants have a vertical ſun twice during their ſummer, and conſequently the climate muſt be exceſſively hot. This, I think, is all that is neceſſary to be remembered of Aſia; we therefore now change the ſcene.

Africa, you obſerve, forms a very conſiderable part of the habitable globe. It has hitherto been ſo imperfectly explored, that our knowledge extends but to a ſmall diſtance

tance from the coaſts, in any part. On the *eaſt*, it is bounded by the Indian Ocean; on the *weſt*, by the Atlantic; on the *north*, by the Mediterranean; and on the *north-eaſt*, by the Red Sea. It extends from 73 degrees of north, to 35 of ſouth, latitude; about 5000 Engliſh miles: conſequently the Equator runs nearly through the middle of it.

If now you begin at the Straits of Gibraltar, here at the north-weſt corner of the map, and follow the ſouth coaſt of the Mediterranean, you come firſt to Algier, then to Tunis, and then to Tripoli; which are the only places of any conſequence on the coaſt of Barbary. Continuing your journey eaſtward, you arrive at Alexandria in Egypt, and paſſing the mouths of the Nile, you come to Grand Cairo; thence, travelling with the celebrated Bruce, between the Nile and the Red Sea, you traverſe the kingdom of Nubia, and arrive in Abyſſinia. From thence, ſtill following the coaſt, you will not find a name that you have ever heard before, or that deſerves to be remembered, till you come to the Cape of Good Hope, at the ſouthern extremity of this continent. It is a Dutch ſettlement, in the country of the

the Hottentots, a people with whom we begin to be better acquainted ſince the publication of ſome late travels into this part of the world.

Having now doubled the Cape, you proceed northward till you come to the coaſt of Guinea; thence you paſs the rivers Gambia, and Senegal on the Negro-coaſt, leaving, a little to the weſtward, firſt, the Cape de Verd iſlands, then the Canaries, and finally the iſland of Madera. On the ſouth ſide of the Equator, you obſerve two ſmall iſlands, at a conſiderable diſtance from the continent, St. Helena and Aſcenſion, both in the track of our Eaſt-India ſhips. There is alſo an iſland on the eaſt coaſt of Africa, called Madagaſcar, too large to have eſcaped your notice.

This map of the continent of America, and of the Weſt India iſlands, requires to be ſtudied with ſome attention; particularly North America, as without a competent knowledge of that country, you cannot poſſibly underſtand the hiſtory of your own times.

By North America is generally underſtood that tract of country which lies between the northern extremity of Hudſon's Bay

Bay and the Gulph of Mexico. Between the latitude 55 and 50 you find, New South Wales and Labrador. This is a very cold climate, though in the ſame latitude with England. From 50 to 45, you have Canada, Nova Scotia, and Newfoundland. Theſe are ſtill very cold countries, though in the latitude of France. Between 45 and 40, lies New England. Thence you proceed ſouthward through Jerſey, Penſylvania, Maryland, Virginia, N. and S. Carolina, Georgia and Florida. Weſtward of theſe you obſerve Louiſiana and the vaſt kingdom of Mexico, extending ſouthward as far as Panama, within 7 degrees of the Equator.

From Panama down to Cape Horn, the ſouth point of America, you paſs no places of note, except Lima the capital of Peru, whence the Spaniards import Gold, and what is more intrinſically valuable, the *Cortex Peruvianus*. In latitude 33 you leave, a little to the weſt, the iſland of Joan Fernandes, rendered famous by Anſon's Voyage. You now double the Cape, and paſſing Falkland's iſland, proceed northward along a deſart coaſt till you come to Buenos Ayres at the mouth of the great river of Paraguay, which runs through an extenſive country of

the

the ſame name; for an account of this river and country, I refer you to the *Travels* of my old acquaintance Don Antonio d'Uloa. About forty years ago, I had the pleaſure of his company from London to Liſbon. He was a Philoſopher, and lamented much that the Inquiſition would not permit him to ſay, the Earth moves round the ſun. You are now arrived at the Braſils, an extenſive country, the coaſt of which is in poſſeſſion of the Portugueze. Having doubled Cape St. Roque and paſſing the mouth of the vaſt river of the Amazons, you touch at the Dutch ſettlement of Surinam, and thence proceed along the coaſt till you come to Curaſao, an iſland, alſo in poſſeſſion of the Dutch. From this iſland they import that ſuperior ſpecies of Tobacco which they call *Kanaſter* or *Varinas*, the name of a town on the Spaniſh *Terra-firma*, in the neighbourhood of which it is cultivated by the inhabitants, who barter it with the Hollanders for European goods.

Hence we continue our coaſting voyage till we arrive at Carthagena and Portobello, names that were familiar to every individual in Britain when I was a boy. We were then at war with Spain. Portobello

was

was taken by Admiral Vernon, who became the hero of the day, and the ſign of an alehouſe in every village. You now come to the Bays of Honduras and Campeachy, where we claim a right to cut Logwood, which right the Spaniards diſpute whenever they want a pretence for quarrelling. Paſſing Vera Cruz, you leave the city of Mexico on the left, and continue coaſting the Gulph, till you come to New Orleans near the mouth of the famous river Miſſiſſippi, the project of a trade to which ſomewhat more than half a century ago, about the time of our South Sea bubble, ruined half the people in France.

Your next objects are the iſlands of Cuba and St. Domingo or Hiſpaniola, as it is alſo called, belonging to Spain. Near the weſt extremity of the former, you find the Havanna, which the late Lord Albemarle and Sir George Pocock, took in the war preceding the laſt. South of Cuba, lies our Jamaica, and to the northward the Bahama iſlands. Eaſt of St. Domingo you fall in with another ſtring of ſmall iſles, the chief of which are Antigua, St. Kitts, Barbadoes and Nevis belonging to us; and to the

French, Martinico, Guadaloupe, St. Lucia and Dominica.

Probably, before you quit America, you may wiſh to be more minutely acquainted with the ſcene of the late war with our rebellious children: a war by which they obtained their liberty: a war that coſt this nation much more money than would have purchaſed the whole country, and almoſt as many men as there are people in it: a war that has overturned the French monarchy, and kindled the torch of Diſcord in different parts of Europe: a war that in its conſequences has ſpread alarm among princes; but a war that immortalized four Engliſh Generals. The various ſcenes of their exploits you muſt look for at Boſton; on Long Iſland near New York; in the Jerſeys, particularly at Trenton; at Charleſtown, at Philadelphia, and at Saratoga.

There remains, I think, nothing more in this map of America, except this cluſter of iſlands, for the knowledge of which we are principally indebted to Captain Cook. I mean the Society Iſlands in the Pacific Ocean, between 15 and 20 degrees of ſouth latitude. In the centre of theſe you obſerve the celebrated Otaheitee.

Thus,

Thus, I flatter myſelf, I have fulfilled my promiſe, in communicating, in the compaſs of two not very long letters, as much Geographical knowledge as you will ever want. In my next, I purpoſe to ſatisfy your curioſity relative to the four prints of *Pæſtum* which I have lately hung up in my ſtudy. Mean while,

I am, &c.

LETTER XXIV.

THAT you ſhould recollect no claſſical information concerning the city of Pœſtum, is not very ſurprizing, as I believe that in the ancient authors you have read, there are but two paſſages in which it occurs: one in the *Georgics*,

Forſitan et pinguis hortos quæ cura colendi
Ornaret, canerem, biferique roſaria Pæſti.

The other in the *Metamorphoſes*,

Leucoſiamque petit, tepidique roſaria Pæſti.

The original name of this city was Poſidonia, from Ποσειδων, *Neptunus*, to whom it was dedicated. When, and why, the Romans changed its name to Pœſtum, I do not know. It is ſituated in the gulph of Salermo, on the weſtern coaſt of Italy, about 60 miles ſouth of Naples. Whether it was built by the Sybarites or by the Dorians, is matter of diſpute; it is certainly however of very remote antiquity, if it be true, as the Sicilian Diodorus tells us, that Hercules in his travels reſted on a rock in the

the country of the Poſidonians. But, be the original founders or poſſeſſors of this city who they might, hiſtorians tell us, that whilſt the Romans were yet in their infancy, Poſidonia was taken by the Lucanians, a colony from the Samnites; that this people were diſpoſſeſſed by the Romans, in the year of Rome 480, at which time it became a Roman colony, and afterwards a municipal town.

About the year of Rome 528, when D. Quintinus was ſent againſt Tarentum, we learn, from Livy, that the three cities of Rhegium, Velia and Pœſtum furniſhed twenty ſhips to the aſſiſtance of the Romans; the ſame author alſo tells us, that, ſix years after, during the Punic war, Pœſtum ſent, by their embaſſadors, a preſent of golden cups, but that they were not accepted. — *Legati a Pæſto pateras aureas Romam attulerunt; iis, ſicut Neapolitanis, gratia acta, non acceptum.* In another place, he makes honourable mention of this city among thoſe, which, after the battle of Cannæ, when the Romans were in great diſtreſs, generouſly aſſiſted them with troops and money, for which they received the public thanks of the Senate and people.

From the time of the Roman Republic, till the ninth century of the Chriſtian *æra*, hiſtorians make no mention of this once magnificent city. But we learn that, in the year 866, Docibilis duke of Gæta, being at war with one of his neighbours the Lord of Capua, ſolicited the aid of the Saracens, a colony from Sicily, then eſtabliſhed in Calabria. They came to his aſſiſtance and remained in poſſeſſion of a conſiderable part of the country, whence they were finally expelled by means of a body of Greeks ſent by one of the Conſtantines. But, before their entire expulſion, in the year 930, they entered Pœſtum in the night, and after pillaging the inhabitants, ſet it on fire.

There remained yet conſiderable veſtiges of its ancient magnificence, till, in the year 1080, the pious zeal of Robart Guiſcard, ſtripped the ancient temples of their ornaments, for the purpoſe of adorning a church which he was then building at Salermo, where, he believed, the bones of St. Matthew were depoſited.

From the many Inſcriptions found in the ruins of this ancient city, I will ſelect the following, as one of the moſt remarkable,

TVLLI. OLERII. POESTANI
QVI. VIX. A. LXXXXV. D. XI.
FF. XXVIII. NN. LXXXIII.
C. L. P. P.

I dare ſay you will conſtrue it without the leaſt difficulty.

In the firſt print, you have a proſpect of the country, and of the ruins of Pœſtum as it now appears at a diſtance. Its walls, you ſee, are wonderfully entire, conſidering their great antiquity. The higher towers next the gates are ſuppoſed to be of more modern conſtruction. Over the arch of the north gate, on the outſide, there is a figure of Neptune, carved on the key-ſtone of the arch, and on that within, a *hippocampus*, or ſea-horſe. The circumference of the city is about two miles and a half. It muſt always have been an unwholeſome place from its vicinity to the *Palus Lucaniæ*, and from the bituminous and ſulphureous ſprings with which it is ſurrounded: for this reaſon the inhabitants were under the neceſſity of procuring water from diſtant hills, as appears by the ruins of ſeveral aquæducts.

The principal ruins within the walls are an Amphitheatre, a Theatre, and the three

Temples which you ſee in theſe three prints. They are all what the Greeks called *amphi-proſtylos*, that is, having two porticos, one to each front. The columns of theſe temples are of the Doric Order, in its moſt ancient manner.

Probably you will be ſurprized when I inform you, that the ruins of Pœſtum were firſt diſcovered about five and thirty years ago. How this diſcovery happened, I will tell you, in the words of my worthy friend Dr. Longfield, to whoſe learned publication, I refer you for a more circumſtantial account of theſe ruins.

" In the year 1755, an apprentice to a painter at Naples, who was on a viſit to his friends at Capaccio, by accident took a walk to the mountains which ſurround the territory of Pœſtum. The only habitation he perceived, was the cottage of a farmer, who cultivated the beſt part of the ground, and reſerved the reſt for paſture. The ruins of the ancient city made part of this view, and particularly ſtruck the eye of the young painter; who, approaching nearer, ſaw, with aſtoniſhment, walls, towers, gates, and temples. Upon his return to Capaccio, he conſulted the neighbouring people about the origin

origin of these monuments of antiquity. He could only learn, that this part of the country had been uncultivated and abandoned during their memory; that, about ten years before, the farmer whose habitation he had noticed, established himself there; and that having dug in many places, and searched among the ruins which lay round him, he had found treasures sufficient to enable him to purchase the whole.

" At the painter's return to Naples, he informed his master of those particulars, whose curiosity was so greatly excited by the description, that he took a journey to the place, and made drawings of the principal views. These were shewn to the King of Naples, who ordered the ruins to be cleared, and Pœstum arose from the obscurity in which it had remained for upwards of seven hundred years, as little known to the neighbouring inhabitants as to travellers." Farewel.

LET-

LETTER XXV.

I MEANT, in ſome future letter, to have brought you acquainted with Botany in its proper place, as a branch of Natural Hiſtory; but as the ſpring is the beſt ſeaſon for beginning the ſtudy of this ſcience, ſubjects of more importance muſt give place to it for a time.

Salvitur acris hyems gratâ vice Veris et Favoni.

Let us therefore turn our preſent attention to that beautiful part of creation

—terræ quem ferunt ſolutæ.

Botany was originally ſtudied with an attention ſolely to the medical virtues of plants. The only ancient Greek author on this ſubject, whoſe writings are now extant, is *Theophraſtus*, the diſciple and ſucceſſor of *Ariſtotle:* he flouriſhed about 320 years prior to the Chriſtian æra: he is ſaid to have written ten books *On the hiſtory of Plants*, one of which is loſt; and eight, *on their cauſes*, of which only ſix remain. In imitation of Ariſtotle's *Hiſtoria Animalium*, his book is not

not a hiſtory of particular plants, but of plants in general. He mentions about 500, but deſcribes ſo few with accuracy, and the reſt ſo very imperfectly, that ſucceeding botaniſts have been able to recognize but a ſmall number of them. Probably Dr. Sibthorp, who has lately explored the country where Theophraſtus herborized, may have aſcertained many of his plants, and I hope he will not long withhold his diſcoveries from the public. *Theophraſtus* was firſt tranſlated into Latin by Geza.

The two later naturaliſts worth notice, are Dioſcorides and the elder Pliny; that unfortunate Pliny who periſhed in the ſmoke of Veſuvius. They appear to have lived at the ſame time, that is, about the middle of the firſt century. Of the writings of Dioſcorides only eight books have been preſerved. He mentions about 600 plants; of theſe he deſcribes about 400: but few of his deſcriptions anſwer to our plants.

Pliny's work is entitled *de Hiſtoria Mundi*, of which only 37 books are preſerved. It is an indiſcriminate collection of all that he had read of Natural hiſtory. The vegetable part is a mere tranſcript from Theophraſtus, Dioſ-

Dioſcorides, and a few other writers whoſe works are loſt.

Pliny ſays, that Cato was the firſt Roman who wrote of Plants, and that, after him, one Pompeius *Lenæus*, a freedman of Pompy, tranſlated into Latin, *Notes and Obſervations* on Simples, written by Methridates, from papers taken by Pompy when he defeated that King. He alſo tells us that Evax, an Arabian King, wrote a book on the virtues of plants, a copy of which he ſent, as a preſent, to the Emperor Nero; that Cratevas, and others, publiſhed coloured drawings of plants; and that Antonius Caſtor, a Roman Phyſician, had a Bontanical Garden, in which he (Pliny) had ſeen moſt of the herbs he deſcribes. This Caſtor was then a hundred years old. Is it not a little extraordinary, that the name of Pompy's freedman, who tranſlated the papers of Methridates, ſhould ſo nearly reſemble that of *Linnæus*, the great author of our preſent ſyſtem of Botany?

If you have any inclination to know the botanical authors from Pliny down to our own Ray, you will find a ſhort account of each, and of their writings, in Tournefort's

Iſagoge

Iſagoge in Rem Herbariam. In this catalogue there is not a ſingle writer, from the firſt to the ſixteenth century, whoſe botanical labours deſerve the leaſt attention. Without methodical arrangement, natural hiſtory ſeems a chaos; yet no attempt at a botanical ſyſtem appeared till the year 1583, when Cæſalpinus, profeſſor of Medicine at Padua, publiſhed his book *de Plantis*, in which they were arranged according to their fructification, or manner of producing their ſeed. But this ſyſtem laid dormant almoſt a century after his death, when it was revived by Moriſon, profeſſor of Botany at Oxford, in his *Hiſtoria Plantarum, Oxonienſis*, fol. 1680. To this ſyſtem ſucceeded that of our excellent botaniſt Ray, many years a reſident member of Trinity college, Cambridge. He formed his 31 claſſes partly on the diſtinctions obſervable in the ſhape of the *corolla*, and partly on the fruit. He publiſhed his *Methodus Plantarum nova* in 1682; the firſt volume of his *Hiſtoria Plantarum* (which you may ſee in the Univerſity Library, in 3 huge folio volumes) was printed in 1686; and his *Synopſis ſtirpium Britannicarum*, in 1690. The beſt edition of this book is that publiſhed by Dillenius in 1724.

The

The next ſyſtem was that of Tournefort, which he firſt publiſhed in French, in the year 1694, and in 1700, in Latin, under the title of *Inſtitutiones Rei Herbariæ*, 3 vols. 4°. The 2d and 3d volumes conſiſt entirely of plates, in all 475. He divides the vegetable kingdom into 22 claſſes, characterized by the ſhape and number of petals in the flower. His generic diſtinctions are founded the fructification.

The firſt of theſe three ſyſtems, invented by Cæſalpinus, was ill adapted to the inveſtigation of ſtrange plants, becauſe it was impoſſible to diſcover the claſs to which they belonged, till the ſeeds were completely formed. Ray's ſyſtem was, in part, liable to the ſame objection. Tournefort's ſyſtem was natural and eaſy enough, in the general claſſification, and his *genera* are commonly aſcertained with ſufficient accuracy; but he goes no farther: ſpecific characters made no part of his ſyſtem.

The Linnæan ſyſtem of Botany is now generally received and univerſally taught. It is confeſſedly artificial; but much better adapted to the inveſtigation of an unknown plant, than any of the former. His *Claſſes* are ſubdivided into *Orders*, and his *Genera*

into

into *Species* and *Varieties*. It is called the *Sexual ſyſtem*, becauſe he conſiders the *Stamina* analogous to the male organs of generation in animals, and the *Piſtilla* to the female. He divides the entire vegetable kingdom into 24 claſſes, 23 of which are diſtinguiſhed by the number, or the comparative length, or the connection, or the ſituation of the *Stamina*. The 24th claſs comprehends the plants in which the organs of generation are inviſible. The *Orders* generally depend on the number of *Piſtilla* in the flower: ſometimes on other circumſtances. The *Genera* are characterized by peculiarities in the flower; the *Species* by the leaves or ſtem, and the *Varieties* by accidental circumſtances.

The firſt thirteen *Claſſes* and their *Orders*, are denominated from the number of *Stamina* and *Peſtilla*; thus, *Monandria monogynia*, from μονος *unicus*, ανηρ *maritus*, and γυνη *mulier*: that is, one huſband and one wife, the flowers of this Claſs containing one *Stamen* and one *Piſtillum*; and ſo of the other thirteen Claſſes and their reſpective Orders; for a circumſtantial deſcription of which, and of all the ſucceeding Claſſes, I refer you to your

your *Clavis*, which you will receive with this letter.

Probably you may have ſome curioſity to know who this celebrated Linnæus was; this inventor of the new ſyſtem you are about to ſtudy. I will therefore give you a ſketch of his life.

Charles Linnæus was the ſon of a Swediſh Divine, and born in the year 1707, at Rœſhult in the province of Smoland. He was, in his infancy, ſo attentive to the knowledge of plants, and conſequently ſo negligent of his other ſtudies, that his father determined to take him from ſchool and to bind him apprentice to a ſhoe-maker. However, in 1717, he was ſent to the Univerſity of Lund, and in 1728 removed to Upſala, where he perſevered in his favourite ſtudy of Natural Hiſtory, under the ſevere oppreſſion of abſolute poverty, until his ſingular abilities and application gained him the patronage of Olaus Celſius, profeſſor of Divinity, and Olaus Rudbeck, profeſſor of Medicine and Botany.

In 1731, he was ſent on a botanical expedition into Lapland, and received, from the Royal Society of Upſala, the ſum of

eight

eight pounds ſterling, for his travelling expences. He was abſent about a year and a half, in which time he walked 4000 miles. Soon after his return, he publiſhed his *Flora Laponica*, in which the plants were arranged and deſcribed according to his own new ſyſtem.

In the year 1735, he began his journey to Holland, where, on the recommendation of the great Boerhaave, he was patronized by Mr. Clifford, whoſe botanical garden he ſuperintended, and at whoſe expence he travelled to France and England. In 1738, he returned to Stockholm, where he married and ſettled as a phyſician. In 1741, he was appointed Profeſſor of Botany at Upſala. In 1753, he was created *Knight of the Polar Star*, and, three years after, enobled. He died in 1778, aged 71.

The diſtinction of male and famale plants was, by no means, the invention of Linnæus. It is as old as *Empedocles*, who wrote a book, *De natura et principiis Rerum*, about the 75th Olympiad, in which, as we learn of Ariſtotle, he ſpoke of plants as being oviparous, and hermaphrodite. An Olympiad, you know, was a period of 4 years, by which the Greeks computed time: this *Empedocles*,

therefore, muſt have lived near a hundred years before Ariſtotle, who was born about the 98th Olympiad. I dare ſay you remember to have read, that this *Empedocles* threw himſelf headlong into Ætna, that the world might believe he was a God. He certainly convinced the world that he was a fool.

Ariſtotle expreſſes ſome doubt of this new doctrine of vegetable generation, yet he tells us, that, if the duſt of a branch from the male Palm-tree be ſhook over the female, her fruit will ſoon ripen.

Theophraſtus, the diſciple of Ariſtotle, obſerves, that the chief diſtinction among trees is their gender, male and female.

Dioſcorides and Pliny, both ſpeak of male and female plants, but without preciſe ideas of either. Cæſalpinus obſerved the difference of ſex in the Claſs of plants which Linnæus has ſince called *Dioeciæ*. But *Zaluzianſki*, a native of Poland, who, I believe, wrote at the latter end of the 16th, or beginning of the 17th century, appears to have been the firſt botaniſt who diſtinguiſhed the ſexes of plants in their various modes of males, females, hermaphrodites, and *androgynæ*.

Many years after this, our countryman Grew,

Grew, and other naturaliſts of different nations, reſumed the enquiry, and, by microſcopical obſervations, diſcovered that the females were impregnated by the *polen* contained in the *antheræ* of the males. On this foundation Linnæus built his *Sexual Syſtem*; a ſyſtem entirely his own. We now return to the other claſſes.

Claſs XIV. DIDYNAMIA, has four *Stamina*, two long and two ſhort: the *Orders* are determined by the Seeds being naked or incloſed in a *Pericarpium*.

Claſs XV. TETRADYNAMIA, has ſix *Stamina*, four long and two ſhort. The *Orders* depend on the form of the *Pericarpium*.

Claſs XVI. MONADELPHIA; *Stamina* united at the baſe; Orders diſtinguiſhed by the number of *Piſtilla*.

Claſs XVII. DIADELPHIA; *Stamina* generally in two diviſions; the flower papilionaceous. The Orders ſignified by the number of *Piſtilla*.

Claſs XVIII. PALYADELPHIA; *Stamina* in three or more diviſions: Orders depend on the number of *Piſtilla*.

Claſs XIX. SYNGENESIA; Five *Stamina*, united in the *Anthera*. Orders determined by the formation of the *Floſculi*.

Claſs XX. GYNANDRIA; *Stamina* on the *Piſtillum*. Orders diſtinguiſhed by the number of *Stamina*.

Claſs XXI. MONOECIA; *Stamina* and *Piſtilla* in ſeparate flowers on the ſame plant. Orders, from the ſituation or number of the *Stamina*; or from the uniting of their *Antheræ*.

Claſs XXII. DIOECIA; *Stamina* and *Piſtilla* on ſeparate plants. *Orders* the ſame as in Claſs 21.

Claſs XXIII. POLYGAMIA; *Stamina* without *Piſtilla*, or vice verſa, or both together. Orders depend on the ſituation of the *Stamina* and *Piſtilla*.

Claſs XXIV. CRYPTOGAMIA; Parts of fructification not diſtinguiſhable. Orders, from habit or apparent reſemblance.

You, who are a Greek ſcholar, will find no difficulty in diſcovering the etymology of the titles of theſe ſeveral claſſes: You will then eaſily fix them in your memory. But I ſhall explain them farther in the examination of particular plants. This method of reading the great book of Nature, and of inveſtigating her productions in the order and ſucceſſion in which ſhe preſents them to our view, I conceive to be far preferable to the dry method of learning Botany by means

means of formal *Introductions* or *Rudiments*, the contents of which it is impoſſible to remember without examples, and which examples it is impoſſible to procure in ſtudying the ſeveral Claſſes in regular ſucceſſon.

I have no intention, in giving you this general introduction to the ſcience of Botany, to allure you from more important ſtudies. You are to regard it as a ſcience of amuſement; but, with this ſtrong recommendation, that it may be acquired without ſtealing a ſingle hour from your neceſſary lucubrations. We read of men, who, in the ſhort ſpace of human life, have acquired a degree of univerſal knowledge, to which one might imagine the age of an antediluvian would hardly have been ſufficient. The late illuſtrious Profeſſor Haller, of the Univerſity of Gottingen, was a remarkable example of this univerſality. He was a minute anatomiſt, an accurate phyſiologiſt, an indefatigable botaniſt, a charming poet, a claſſical ſcholar, an univerſal linguiſt, an aſtoniſhing bibliothecarian, and, in the latter part of his life, a moſt intelligent magiſtrate.

That a man of univerſal erudition was

no uncommon phenomenon among the ancients, appears from the following paſſage in Cicero, who, in ſpeaking of the Greek philoſopher, ſays — *in qua difficile eſt enumerare quot viri, quanta ſcientia, quantaque in ſuis ſtudiis varietate et copia fuerint, qui non una aliqua in re ſeperatim elaborarent, ſed omnia quæcunque eſſent, vel ſcientiæ perveſtigatione, vel differendi ratione comprehenderent.*

Geſner, the great Swiſs naturaliſt, was ſo aſtoniſhing a prodigy of knowledge, that Boerhaave uſed to call him *Monſtrum eruditionis.* His extenſive learning appears truly wonderful, when we conſider, that he ſhone in the midſt of a dark world; in an age of groſs ignorance, and depreſſed by indigence. He lived early in the 16th century.

Genius, application and memory, are doubtleſs neceſſary to the attainment of what may be called univerſal knowledge: by univerſal knowledge, I mean an intimate acquaintance with ſome ſciences, and ſomewhat more than a ſuperficial knowledge of the principles of all: but, I believe, the labour of becoming thus univerſally learned is not ſo very herculean as we generally imagine; and that it depends principally on a ju-

a judicious arrangement of our ſtudies, and diſpoſition of our time. In the arrangement of our ſtudies we ſhould imitate the ſkilful agriculturiſt, whoſe ſucceſſive crops ſo relieve each other, as to preclude the neceſſity of *fallowing*; and, as to the diſpoſition of our time, let us take Botany for an example. A man who ſtudies all day and every day, will, in a few years, become unhealthy and ſtupid: therefore, part of every ſtudent's time muſt be loſt in exerciſe. *Loſt* did I ſay? No: it is not loſt to a Botaniſt. He ſtudies where other men, for want of books, muſt lounge. To him the book of Nature lies conſtantly open. He reads as he walks along: every field is a new chapter; every leaf is an object of attention, and every flower a prize. A general knowledge of Botany therefore may be learnt at times when other ſtudies are neceſſarily ſuſpended; conſequently it interferes with no other ſcience. I ſay a *general knowledge*, which is enough for a gentleman who ſtudies Botany as an amuſement: an univerſal and minute botaniſt muſt unavoidably neglect things of more importance. In my next letter I ſhall lead you into the fields.—Remember to

take, in one pocket, your *tin box*, and, in the other, the second volume of your *Synopsis**.

Adieu.

* *Synopsis of the Natural History of Great Britain and Ireland, printed for T. Cadell*, 1789.

LET-

LETTER XXVI.

MARCH, 1790.

IF you have read my laſt letter with attention, the 24 claſſes of Linnæus are fixed in your memory: without a perfect recollection of theſe, it is impoſſible to proceed a ſingle ſtep in the modern ſyſtem of Botany. As to the *Orders*, it will be time enough to look round the houſe when you are introduced to the family.

Notwithſtanding the remarkable mildneſs of the winter, you ſee, our botanical enquiries of to day, will be confined to a ſmall number of flowers. The common Daiſy, and that yellow ſtar, which you obſerved, in abundance, on the declivity of the ditch near the iron gates of King's, are the only flowers we have ſeen. Let us begin with the moſt common of all flowers of the field, the Daiſy, univerſally called, in Latin, *Bellis*. The ſpecific, or trivial, name, given by Linnæus to the ſpecies in your hand, is *perennis*, to diſtinguiſh *Bellis.*

it

it from the other, which he calls *annua*. The firſt of theſe only, grows wild in this kingdom. Notwithſtanding its vulgarity, you will find it a very curious object. You will hardly believe me when I tell you, that there are, in that ſingle Daiſy, about one hundred and twenty complete yellow flowers, beſides fifty white ones without *Stamina*.

As to its name, *Bellis*, ſays Ray, *Latinis a bello ſeu pulchro colore florum dicta creditur*; and its Engliſh etymology, we learn from theſe lines of our ancient poet Chaucer,

> Well by reaſon men it calle maie
> The Däiſie, or elſe the Eye of the daie.
> And at the laſt there tho' began anon
> A Lady for to ſing right womanly
> A Bargonet in praiſing the Daiſie;
> For as methought among her notis ſwete
> She ſaid, *ſi douce eſt la Margarete.*

You will find this paſſage quoted at length in Curtis's *Flora Londinenſis*.

If now you pull out one of the white external rays of this little flower, of which there are about 58, by applying this magnifying glaſs, you will find it tubular at

the bottom, and containing a ſingle *piſtillum*. You now detach ſome of the yellow florets which compoſe the diſk; each of theſe you will diſcover to be a perfect tubular flower, containing 5 *ſtamina* and one *piſtillum*. Now as each of theſe florets of the diſk is provided with the male and female organs of generation neceſſary to the production of ſeed, the *piſtillum* in the *radii* is ſuperfluous; which circumſtance determines the *Order* to which it belongs, viz. *Polygamia ſuperflua*; and that it is of the Claſs *Syngeneſia* is evident, becauſe the flower conſiſts of a number of florets compriſed within one calyx, which is the general characteriſtic of that claſs. You are alſo to obſerve, that, in this claſs, the *ſtamina* are united at their extremities, ſo as to form a cylinder; and that, at the bottom of each floret, there is a ſingle ſeed placed on the *receptaculum*. For the meaning of theſe and other technical terms, I muſt refer you to your *Clavis* *, where I have explained them according to what I conceive to be the Linnæan acceptation.

I need

* *Clavis Anglica Linguæ Botanicæ, or a Botanical Lexicon, &c.* the firſt edition of which I publiſhed when I was a ſtudent of Medicine at Edinburgh. It was originally written for my own uſe, and republiſhed laſt year.

I need not tell you that the word *Syngeneſia* is derived from Συν, *ſimul*, and Γενεσις, *generatio*, and that it is the 19th claſs; a particular explanation of which you will alſo find in the book laſt mentioned.

Having now ſtript off all the florets, white and yellow, there remains, in your hand, a naked conical *receptaculum*; ſeeds without *pappus*; calyx hemiſpherical, compoſed of uniform ſcales; ſeeds obovate. Theſe peculiarities determine the *genus*.

The Species is diſtinguiſhed by the ſtalk being naked, *ſcapo nudo*.

If Chaucer, in the lines above quoted, alluded to this our common Daiſy, probably he was miſtaken in the French name, which is *Paquerete*. The plant which the French call *Margarite* is the *Chryſanthemum leucanthemum*, or Ox-eye Daiſy; eaſily diſtinguiſhed from the former by its ſize, the leaves on the ſtalk, &c.

From this ſpecimen, I conceive, you have acquired botanical knowledge ſufficient to diſtinguiſh the plants of the Claſs and Order, *Syngeneſia*, *polygamia ſuperflua*, whereſoever you may find them. Let us now examine one of thoſe yellow ſtar-like flowers which grow in ſuch abundance in this field.

On

On the firſt inſpection, you perceive that the *ſtamina* are more than 20; therefore it is of the Claſs *Polyandria:* and in the centre of the flower, you find a great number of *germina*, which are the female organs, though without *ſtyli*, and their *ſtigmata* are very minute. This brings it to the Order *Polygynia.* *Ranunculus.*

As to the *genus* of this plant, authors differ. The celebrated Haller and Hudſon, make it a diſtinct genus, and call it *Ficaria verna.* But our great maſter Linnæus muſters it among the *Ranunculi*, and he is followed by Curtis and Relhan. Theſe are indiſputable authorities. This is the generic character of the Ranunculus—*Calyx pentaphyllus; Petala quinque, intra ungues poro mellifero.* Now the flower in your hand has a *calyx* of but 3 leaves, and the petals are 8 in number; but theſe differences which are not invariable, are inſufficient to conſtitute a new genus. The ſcale and *nectarium* at the baſe of each petal; their gloſs and the general *habitus* of the plant declare it to be a Ranunculus.

The Species we diſcover, by its leaves being heart-ſhaped, angulated, on long *petioli*; and

and by each ſtalk ſupporting a ſingle flower. This deſcription agrees only with the *ficaria:* ſo that we now no longer heſitate to call our plant the *Ranunculus ficaria* of Linnæus, or Pilewort; of which you will find a very good plate, well coloured, in my copy of the *Flora Londinenſis.*

Caltha. On the oppoſite ſide of that ditch, you ſee a yellow flower, ſomewhat larger than this, apparently of the Ranunculus *genus.* It is indeed of the ſame Claſs and Order, viz. *Polyandria Polygynia*, but differs from the *Ranunculi* in having no *calyx*, no *nectarium*, and in its ſeeds being incloſed in capſules. It reſembles the *Ranunculi* in having 5 rounded petals; but they are not glazed on the upper ſide. The flowers grow in pairs on ſeparate *pedunculi*. The leaves are heart-ſhaped. It is the *Caltha paluſtris*, the only ſpecies of that genus hitherto found in any part of the world. You will find them in almoſt every ſwamp, and particularly in very great abundance on the moraſs at the back of Peter-houſe.

I ſup-

I ſuppoſe Thomſom meant this Water-lily in theſe lines,

——— See how the lily drinks
The latent rill, ſcarce oozing thro' the graſs,
Of growth luxuriant, or the humid bank
In fair profuſion deeks.

Under thoſe trees, in the language of the ſame poet,

——— where purple violets lurk
With all the lowly children of the ſhade,

you will find ſome purple flowers. You know them to be violets by the ſmell. But you wiſh to learn to what Claſs and Order they belong. Carefully inſpecting the centre of the flower, you will diſcover 5 ſtamina, the *antheræ* of which are united. Now this being the eſſential characteriſtic of the *Syngeneſia*, it certainly is of that claſs; but, as in this Violet, we do not find a number of florets incloſed in one common calyx, it muſt neceſſarily belong to the Order *Monogamia*; which differs remarkably from the other 5 Orders of this claſs, in the flower being ſimple. This Order excepted, the claſs Syngeneſia is perfectly natural. The generic character of the Violet is, Calyx of 5 leaves;

5 leaves; Corolla of 5 petals, irregular, horned behind; Capſule above, trivalve, unilocular. The Species is determined by the plant producing no Stem; the leaves being heart-ſhaped, and ſuckers creeping. It is called by Linnæus *Viola odorata*. In the *Flora Londinenſis* you will ſee the minute parts of the Violet with more eaſe than in the natural flower.

Of the *genus* Viola, there are 28 ſpecies; only 6 of which have been found in this kingdom, and but 4 in Cambridgeſhire, as you learn from my friend Relhan's valuable *Flora*. Theſe are

Viola odorata, ſufficiently diſtinguiſhed by its ſmell.

V. herta, is inoderous and hairy; the *bracteæ* grow lower on the *pedunculus*, and it blooms ſomewhat later.

V. canina, produces a ſtem; its flower, which is ſometime white, is larger, and does not appear till April.

V. tricolor, is ſufficiently diſtinguiſhed by the colours of the flower, and the oblong ſhape of its leaves. Blooms in May.

Nar-

This pale yellow flower, which I gathered at the corner of the wood, you ſee, has ſix *ſtamina* and one *piſtillum:* therefore it is of the Claſs *Hexandria* and of the Order *Monogynia.* The *petela* are ſix, and the *calyx* is a *ſpatha.* Now conſult your *Flora Cantabrigienſis,* and you will find but two *genera* in this Claſs and Order whoſe *calyx* is a *ſpatha,* or ſheath, viz. *Allium* and *Narciſſus.* In the firſt of theſe, the *ſpatha* contains ſeveral flowers: in the plant in your hand, it includes but one: therefore it is the latter. And as there is in this county but one *ſpecies* of this *genus,* you cannot miſtake in calling it the *Narciſſus pſeudo-narciſſus,* or Engliſh Daffodil. Mr. Relhan found it at Whitwell, near Coton, and at Whittlesford. *Narciſſus.*

Linnæus enumerates 14 ſpecies of *Narciſſus.* In number 61 of the Botanical Magazine, you will ſee another ſpecies of this plant, which, the author obſerves, has been overlooked by Linnæus. He calls it the *incomparabilis,* after our ancient botaniſt Parkinſon. There is alſo a tolerable wooden repreſentation of it in Gerarde, who calls

it *Narciſſus omnium maximus, ſeu nonpareile.* It is well known to the London gardeners by the name of the Egg Narciſſus, or Orange Phœnix.

Beſides this which I have gathered, there is a ſpecies, called *poeticus*, found in ſome parts of this kingdom. It is rather a rare plant. Its ſpecific appellation you will eaſily conceive originates in a ſuppoſition that this is the flower into which the ſelf-enamored ſon of Cephiſſus was metamorphoſed.

——— croceum pro corpore florem
Inveniunt, foliis medium cingentibus albis.

It ſeems, indeed, pretty evident, from the deſcriptions of Theophraſtus, Dioſcorides and Pliny, that our Daffodil is a ſpecies of the Narciſſus of the ancients. There is but one objection to this ſuppoſition: they do not, by any means, agree in their time of flowering. The firſt and laſt of theſe ancient naturaliſts tell us that their Narciſſus blooms about the Autumnal equinox, and Virgil's

——— *nec ſera comantem*
Narciſſus,

I am ſure you remember.

What

What tree, or rather ſhrub, is that in the hedge, bearing thoſe white bloſſoms? Let us examine the flower. *Prunus.*

The *ſtamina*, you perceive, are numerous, 20 or more: therefore it is either of the Claſs *Icoſandria* or *Polyandria*. But I have no doubt to which it belongs, when I ſee that the *ſtamina* are not fixed to the *receptaculum*, but to the inſide of the *calyx*; that circumſtance being peculiarly characteriſtic of the Claſs *Icoſandria*. Beſides, the calyx is of one leaf, and the petals are fixed to the ſide of it; circumſtances which poſitively diſtinguiſh this claſs.

In the centre of theſe *ſtamina* you find one *piſtillum*: therefore it is of the Order *Monogynia*; of which this iſland produces but one genus, viz. *Prunus*. Of this genus I have, in the *Synopſis*, deſcribed 5 ſpecies, only three of which grow in this part of the kingdom.

In the *inſititia* the *pedunculi* grow in pairs, the leaves are oval and a little woolly. In the *ceracius* the flowers grow in a kind of ſhort umbell, and the leaves are ovato-lanceolate. But in the *ſpinoſa* the leaves are lance-ſhaped, ſmooth, ſerrated, the branches ſpinous, and the flowers grow from the alæ of the leaves on ſingle *pedunculi*; all which

circumſtances unite in the ſhrub from which you took this bloſſom: therefore it is the *Prunus ſpinola*, Black-thorn, or Sloe.

This claſs *Icoſandria* comprehends many fruit-bearing trees and ſhrubs, none of which are indigenous in this kingdom except the Sloe, the wild Pear, the Crab, the Bramble, the Medlar, the Raſberry, and the *Sorbus*, or Service-tree; that tree of the fruit of which Virgil tells us, the Scythians made a liquor in imitation of wine; that is, a ſort of Cyder. Sitting by a good fire

Hic noctem ludo ducunt, et pocula læti
Fermento atque acidis imitantur vitea ſorbis.

Of theſe trees and ſhrubs, only the firſt four are found wild in Cambridgeſhire.

As this month is not very prolific of flowers in the fields, let us walk down towards yon rivulet. Probably we may find more trees that will bring to your recollection other lines of my favourite Roman poet.

Populus. Thoſe trees growing on the banks are the *Populus nigra*, Black Poplar: its male and female bloſſoms are on ſeparate trees; conſequently they are of the Claſs

Claſs *Dioecia*. In the male flower you will find eight *ſtamina*; therefore the Order is *Octandria*. The *calyx* of the *amentum* is a lacerated ſcale, and the corolla turbinated, oblique and entire. In the female, the *ſtigma* is quadrifid; the capſule bilocular, and the ſeeds numerous and downy: ſuch is the generic character. The ſpecies is determined by the leaves being of a rhomboidal ſhape, dark green and on yellow foot-ſtalks.

The Poplar, and probably this ſpecies, is among the trees that Virgil ſuppoſed to grow ſpontaneouſly, without ſeed.

Namque aliæ, nullis hominum cogentibus, ipſæ
Sponte ſua veniunt, campoſque et flumina late
Curva tenent; ut molle ſiler, lentæ geniſtæ,
Populus, et glauca canentia fronde ſalicta.

What this *ſiler* was, is doubtful. Commentators alſo differ in opinion concerning the *lentæ Geniſtæ*. It has generally been tranſlated Broom, named *Spartium* by Linnæus, whoſe *Geniſta* is our Furze or Whin. Virgil in the ſame book of his Georgics, mentions the *Geniſta* as affording leaves for

the cattle, ſhade for the ſhepherds, hedges for the fields, and food for the bees.

— ſalices, humileſque geniſtæ
Aut illæ pecori frondem, aut paſtoribus umbras
Sufficiunt, ſeptemque ſatis, et pabula melli.

Neither of theſe ſhrubs ſeem to anſwer theſe ſeveral intentions.

Adieu.

LET-

LETTER XXVII.

APRIL.

PREVIOUS to the conſideration of any new plants which we may meet with in this day's ſtroll, let us recollect the Claſſes and Orders with which you became acquainted in our laſt excurſion. Theſe were

Bellis perennis, of the Claſs *Syngeneſia* and Order *Polygamia ſuperflua.*

Ranunculus ficaria, and *Caltha paluſtris* both of the Claſs *Polyandria* and Order *Polygynia.*

Viola odorata, of the Claſs *Syngeneſia* and Order *Monogamia.*

Narciſſus pſeudo Narciſſus, of the Claſs *Hexandria* and Order *Monogynia.*

Prunus ſpinoſa, of the Claſs *Icoſandria* and Order *Monogynia.*

Populus nigra, of the Claſs *Dioecia* and Order *Octandria.*

Theſe ſeven plants being your firſt botanical acquaintance, I hope you will acknowledge them whenever you meet them in fu-

ture, and that you will recollect to what Regiment and Company they belong.

Primula. The pale yellow flowers that ſo beautifully adorn that bank, are alſo old acquaintance. You have known them, from a child, to be called Primroſes; but their vernacular appellation is all you know of them. Let us firſt try to diſcover their Claſs. Having ſtripped off the *calyx* and divided the *corolla*, you ſee, at the bottom of the tube, 5 very ſhort *ſtamina:* therefore it is of the Claſs *Pentandria*, and the ſingle *piſtillum* in the centre, leaves no doubt as to the order. The *corolla*, you ſee, is regular, monopetalous, and fixed below the *germen*. The ſeeds are incloſed in a *capſula*. Theſe circumſtances fix it in the ſecond diviſion of this Order. The *genus* is determined by the *involucrum* at the baſe of the *umbel*, the cylindrical ſhape of the tube of the *corolla*, and its open mouth; the *ſpecies*, by its hairy wrinkled, dentaled leaves, and each ſtalk bearing but one flower. The down on the calyx and ſtalk, is longer and thicker than in the Cowſlip.

You

You will find a conſiderable difference in the opinions of botanical writers concerning this *genus*. In the *Flora Anglica*, and in my *Synopſis*, there are three *Species*, viz. *Primula vulgaris*, Primroſe; *P. veris*, Cowſlip; and *P. farinoſa*, Bird's-eye. To theſe our friend Relhan adds *P. inodora*, Oxlip, which I have made a variety of *P. veris*. Now Linnæus conſiders the Primroſe, the Cowſlip and the Oxlip, as varieties of the ſame ſpecies. Theſe are diſagreements that frequently occur among botanical writers, owing to the difficulty of drawing a diſtinct line between Species and Variety. Theſe ſeveral plants, however, whether you call them Species or Varieties, are ſo evidently different in appearance, that you can never miſtake one for the other.

This Claſs *Pentandria*, the 5th in the Linnæan Syſtem, contains the moſt plants, except the Claſs *Cryptogamia*. It comprehends 6 Orders, diſtinguiſhed by the number of the *piſtilla*. In the Order in which you found the Primroſe, the plants are arranged according to the number and ſituation of the *petala*, and ſeeds.

That

Alcine. That trailing plant with ſmall white flowers, you tell me, without heſitation, is common Chickweed. You are probably right, becauſe there is no other plant, to which it bears any reſemblance, yet in bloom; but, next month you will find other plants, which are alſo commonly called Chickweed: they bear a ſtrong family likeneſs to this plant, but are of a different claſs. The *ſtamina*, you find, are 5, and the *piſtilla* 3. The Claſs and Order therefore are determined. Turning to your *Synopſis*, you find in this Order, *Trigynia*, only four *genera*, three of which are trees, and the fourth *Alcine media*, the plant in your hand.

In the Claſs *Decandria*, there are three genera, viz. *Silene*, *Stellaria* and *Ceraſtium*, from ſeveral ſpecies of which the *Alcine media* is not eaſily diſtinguiſhed. Curtis ſays, it may be known from every other plant, by its petals being ſhorter than the calyx, and its ſtem alternately hairy on one ſide. Its flowers have been obſerved to open about 9 in the morning and to cloſe at noon.

This

This plant, with blue flowers, which I gathered under the hedge, you may poſſibly know by the ſmell. However, let us examine it ſcientifically: the ſmell may deceive you. If you open the flower, you will diſcover 4 ſtamina, two of which are ſhorter than the other two: therefore the claſs is *Didynamia*, in which there are but two Orders, viz. *Gymnoſpermia*, ſeeds naked, and *Angioſpermia*, ſeeds incloſed in a veſſel. Here the ſeeds are naked, it is therefore of the firſt of theſe Orders. If now you obſerve the *antheræ*, you will ſee that each pair forms a croſs, which is the generic character of the plant *Glecoma*; and as there is but one Species of this *genus*, it can be no other than the *Glecoma hederacea*, or Ground-ivy. *Glecoma.*

The corolla of the *Glecoma*, you obſerve, is of a particular and irregular ſhape: its upper lip ſtands erect and is divided halfway down; the under, ſpreads and is cut into three ſegments, forming a kind of gaping or grinning mouth. Moſt of the flowers of this Claſs have the ſame appearance and are therefore eaſily known. It comprehends

hends the *Labiati*, lipped; *Verticillati*, whirled; *Perſonatæ*, maſked; and *Ringentes*, grinning flowers of former botaniſts. The Balm, the Mint, the Lavender in our gardens; the nettles under the hedges, and that *Lamium*, which you may ſafely pull notwithſtanding its reſemblance to a nettle, are of this Claſs and Order.

Lamium. Of theſe *Lamiums* you will find three Species, viz. *L. album*, *L. purpurium*, and *L. amplexicaule*. The two firſt are named from the colour of their flowers: conſequently, that in your hand is the white Dead-nettle; which, beſides the colour of its flowers, is diſtinguiſhed by its leaves being more acute. In the *amplexicaule*, the upper leaves embrace the ſtem, are almoſt circular and deeply notched. You will know theſe Lamiums from other plants of the ſame Claſs and Order, by the upper lip of the flower being entire, the lower having two lobes, and a tooth on each ſide the mouth. You will find excellent plates of theſe three *Lamiums* in the *Flora Londinenſis*.

Now

Now pull me a good ſpecimen of that umbelliferous plant with white flowers, that ſeems to thrive ſo well under theſe elms. I have no difficulty in telling you its name, without examination, becauſe I know there is no other plant of that kind yet in flower. It is the *Chærophyllum ſylveſtre*, Cow-parſley or wild Cicely, of the Claſs *Pentandria* and Order *Digynia*, which Order comprehends, though not excluſively, the *Umbelliferæ* of Ray and Tournefort. You perceive what is meant by *Umbelliferæ*. The flowers, you obſerve, grow at the end of ſpokes, or radii, proceeding from a common centre, each of which centres reſts on the extremity of another ſpoke, alſo proceeding from a general centre; ſo that it forms a large or general umbel, or umbrella, with a ſmall one at the extremity of each radius or rib. The ſmall leaves ſurrounding the root of the umbel, are called the *involucrum*: in the preſent inſtance, it belongs to the ſmall or partial umbel only, the general umbel having none. The *Chærophyllum.*

pre-

preſence or abſence of this *involucrum*, in plants of this Order, is frequently a very uſeful diſtinction; indeed every the moſt minute circumſtance is neceſſary in order to diſcriminate theſe umbelliferous plants, which are a numerous tribe and many of them very like each other.

The generic character is: *Involucrum* reflexed, concave; *petala* inflexo-cordate; fruit oblong, ſmooth. Specific character: Stem, in the thick part, groved and hairy, a little ſwoln and purpliſh near the joints; Leaves proceeding from a ſhort ſheath.

The common height of this plant is about two feet; but there is one now in the walks of Queen's College, that meaſures upwards of 4 feet, and is more than half an inch in diameter at the bottom. Three days ago, I met with a ſpecimen at the back gate of St. John's, the entire ſtem of which was a deep purple. The number of radii are generally 7 or 8: in that which is now growing in Queen's walks, one of the general umbels has eleven. You will find a good engraving of the *Chærophyllum ſylveſtre* in *Curtis*.

There is another ſpecies common in this king-

kingdom, to which Linnæus has given the ſpecific name of *temulum*, for no very obvious reaſon. I do not even know the word. Pliny, I remember, uſes *temulentia* for drunkenneſs. But we have no buſineſs with this ſpecies at preſent, as it will not flower till July.

Look at your watch. Not quite noon. Then we have time ſufficient to mount the Hills, where we ſhall find an elegant little plant now in bloom, of which my friend Relhan has given an engraving rather too much expanded, but an accurate deſcription.

There it is, in great abundance. You have no difficulty in pronouncing it to be of the Claſs *Polyandria* and Order *Polygynia*. You ſee it has no calyx, and the petals are 6: therefore it muſt be a ſpecies of *Anemone*, of which *genus* there are, in this kingdom, but four ſpecies, and in Cambridgeſhire only two, viz. *A. pulſatilla* and *A. nemoroſa*. The firſt of theſe is particularly diſtinguiſhed by its jagged *involucrum*, its ſtalk being 8 or 10 inches high, its purple flower, and *foliis bipinnatis*. The flowers in *Anemone.*

your

your hand, you ſee, correſponds exactly with this deſcription; you have therefore no doubt that it is the *Anemone pulſatilla*, or Paſque-flower.

Ulmus. Let us now deſcend into the vale.—Thoſe trees, in that hedge, which Virgil diſtinguiſhes for their luxuriant produce of leaves,

———*fecundæ frondibus Ulmi*,

are now in bloom. If you examine the flower, you will find 5 *ſtamina* and 2 *piſtilla*: they are therefore of the Claſs and Order, *Pentandria Digynia*. You know the *genus* by the *calyx* being ſhaped like a top, wrinkled, with 5 ſegments and the *ſtamina* being double its length. The ſpecies is determined by its leaves being doubly ſerrated: beſides, it is the only Elm in this country. Linnæus calls it *Ulmus campeſtris*.

Vale.

LET-

LETTER XXVIII.

MAY.

——— *While the roſy-footed May*
Steals bluſhing on, together let us tread
The morning dews, and gather in their prime
Freſh-blooming flowers.

THE firſt, among the objects of our purſuit, that catches your eye, is that beautifully whitening hedge. *Crataegus.*

The Hawthorn whitens, and the juicy groves
Put forth their buds, unfolding by degrees,
Till the whole leafy foreſt ſtands diſplay'd.

The ſight of the Hawthorn brought theſe lines to my memory. I do not repeat them for their beauty: *Juicy* is a vile epithet applied to groves, and the lines are very proſaic. Examine one of the flowers, and you will find in it about 20 ſtamina, which, with the petals, are fixed, not to a *receptaculum*, but to the inſide of the calyx: you know it therefore to be of the Claſs *Icoſandria*, and the two ſtyles tell you the Order. But theſe

two ſtyles, you obſerve, are, in fact, the diviſions of one *piſtillum*. From this circumſtance, Dr. Stokes, in Withering's *Botanical Arrangement*, aſſerts, that this our common Hawthorn is the Cratægus *monogyna*, and not the *oxyacantha* of Linnæus, as Hudſon, Relhan, Lightfoot and I have made it. Dr. Withering is of Stokes's opinion, and accordingly ſubſtitutes the *monogyna* for the *oxyacantha*. But the ſpecific character of the firſt is, *foliis ſubtrifidis acutis*; that of the latter, *foliis obtuſis ſubtrifidis ſerratis:* now the leaves of our Hawthorn are certainly obtuſe and ſerrated. As to the *piſtillum*, it is ſometimes entire, but more frequently divided into two ſtyles, and ſometimes theſe ſtyles are diſtinct down to the bottom. Lyons, in the MS. quoted by Relhan, ſays, that the ſtyle is firſt ſimple and afterwards divided. I doubt this fact, becauſe I have repeatedly found the ſtyle divided before the expanſion of the *corolla*.

There are in the laſt edition of the *Syſtema Vegetabilum*, 15 ſpecies of the Cratægus, only three of which are found in this country, viz. *C. aria*, Whitebeam tree; *C. torminalis*, Service tree; and *C. oxyacantha*, Hawthorn.

thorn. This is not the firſt ſhrub, or tree (for when it ſtands ſingle it generally deſerves the latter appellation) that we have examined belonging to this Claſs *Icoſandria*. In March, you remember, we met with the *Prunus ſpinoſa* in bloſſom; but it is of the Order *Monogynia*.

Let us now examine that yellow flower which grows ſo profuſely among the green corn. The petals of the flower being four, equal, and in the form of a croſs, tell us, at once, that it is of that natural claſs called by Ray, *Siliquoſæ*; by Tournefort, *Cruciformi*, and by Linnæus, *Tetradynamia*, from from Τεσσαρες *quatuor* and Δυναμις *potentia*. The *Stamina*, you obſerve, are ſix, four long and two ſhort ones: at the baſe of the latter, there is a nectariferous gland, which, that it may not be compreſſed, obliges two of the *ſtamina* to make a curve; this circumſtance renders them ſhorter than the other four. *Sinapis.*

The Orders in this Claſs are *Siliculoſæ*, ſeeds in a broad pod or pouch, and *Siliquoſæ*, ſeeds in a long pod. But theſe diſtinctions are of no uſe in the preſent ſtate of this

plant. You will find it however among the *Siliquoſæ*, and its expanded calyx, the erect claws of the petals, the gland between the ſhort *ſtamina* and the *piſtillum*, and between the longer and the calyx, declare it to be of the genus *Sinapis*.

The *ſpecies* are diſtinguiſhed by the pods; but, as theſe have not yet appeared, we muſt find ſome other mark. There have been diſcovered, in all, 17 different ſpecies of *Sinapis*, but three of which grow wild in this kingdom: theſe are *S. nigra*, black Muſtard, *S. alba*, white Muſtard, and *S. arvenſis*, wild Muſtard or Charlock. Now the firſt my friend Relhan has thus characterized, *caulis valde remoſis, ramis diſtantibus expanſis*; which deſcription does not apply to the plant in your hand: in the ſecond, the leaves are deeply cut and jagged, and the ſtem finely groved; beſides, neither of theſe bloom in this month; it muſt therefore be the *Sinapis arvenſis*. There is another pernicious cornweed which you will find in flower in July, that much reſembles this Charlock: it is the *Raphanus raphaniſtrum*; but it is not ſo tall a plant, is of a lighter green, the branches are longer in proportion, and the leaves are pinnatifid. The flowers of this *wild Radiſh*

are

are ſometimes white and ſometimes of a pale fleſhcolour, but generally yellow with dark veins.

Here is another weed, with white flowers, which, on theſe lands, ſeems more inimical to the farmer than the Charlock or any other. You will find it of the Claſs *Pentandria* and Order *Monogynia*. *Lythoſpermum.*

The flower, you obſerve, is monopetalous, regular, and fixed below the germin; the ſeeds are naked, and the leaves are rough: therefore we ſhall find it in the firſt diviſion of the firſt Order of this Claſs. The *corolla*, you ſee, is ſhaped like a funnel, with five ſlight ſegments obtuſe and erect. The tube is cylindrical and open. The *calyx* has 5 diviſions. Now theſe circumſtances unite only in the *genus Lithoſpermum*, of which Linnæus has 8 ſpecies: three of theſe are natives of Britain, but only two have been found in Cambridgeſhire, viz. *L. officinale*, and *L. arvenſe*. The ſtem of the firſt grows to the height of about 2 feet. The plant in your hand is not above half that height. In the firſt the leaves are veined; in this they are not: but the redneſs of the root

determines your plant to be the *L. arvenſe* or baſtard Alkanet. Linnæus ſays, the girls in Sweden paint their faces with this root on certain feſtivals.

Eryſimum. What is that very upright plant, with a ſmall white flower, under the hedge? The flower tells you, at once, that it is of the Claſs *Tetradynamia*, and the long pod informs you, that it is alſo of the Order, *Siliquoſa*. Now the pods, you obſerve, are columnar, and ſquare, and the calyx cloſed: therefore it is an *Eryſimum*; and, if you rub any part of the plant, the garlic ſmell will tell you, that it can be no other than the *E. aliaria*, called *Jack by the hedge* or *Sauce alone*. It is diſtinguiſhed from other ſpecies of *Eryſimum*, by its heart-ſhaped leaves. It grows to the height of 2 or 3 feet. The ſtem is round, ſmooth, branched towards the top; branches alternate, erect, and the flowers ſmall and terminal, as you ſee.

Cardamine. Thoſe purple-white flowers that are ſprinkled on that meadow, are of the ſame Claſs and Order as the laſt,

laſt. The Latin name is *Cardamine pratenſis*, and the Engliſh, *Ladies-ſmock*. This reminds you of Shakeſpear's ſong in *Love's Labour loſt*,

When daizies pied and violets blue,
And Lady-ſmocks all ſilver white,
And Cuckow buds of yellow hue
Do paint the meadows with delight.

You will find theſe lines quoted by *Curtis* in the *Flora Londinenſis*, and a very neat plate of the flower; but he makes no comment on the lines, which ſeem to want ſome explanation. I have never yet met with any *ſilver-white* Lady-ſmocks: they have always a conſiderable tinge of red or purple. As to the *Cuckow-buds of yellow hue*, it is difficult to aſcertain the flower meant by the poet. It evidently was not the *Lychnis-floſcuculi*, which we call Cuckow-flower; for that is red, as you will ſee: we ſhall probably meet with it in the next meadow.

I fancy theſe *Cuckow-buds of yellow hue*, were the common Butter-cups that ſo delightfully paint this luxuriant meadow. There is indeed no other flower that may with eqaul propriety be ſaid to paint the meadows yellow: beſides, the flower of this

Ranunculus, before it expands, has the appearance of a bud. Are they not called Cuckow-buds in Staffordſhire?

But to return to our *Cardamine pratenſis*. It is the only ſpecies of this *genus* found near Cambridge. It is diſtinguiſhed by its leaves being pinnated, and the *folioli* of the radical leaves being roundiſh, whilſt thoſe on the ſtem are lance-ſhaped. The generic character is—Pod burſting, the valves then rolling back: *Stigma* entire; *calyx* a little open.

There are in all 15 ſpecies of *Cardamine*, ſix of which are indigenous in Britain.

Vicia. That plant with papilionaceous purple flowers, climbing up the hedge, is obviouſly of the Claſs *Diadelphia*, and the number of its *ſtamina* will tell you, that it is of the Order *Decandria*. Now take off the *corolla*, and you will diſcover that the ſummit of the *piſtillum*, called the *ſtigma*, is tranſverſely bearded. This minute peculiarity determines its generic name to be *Vicia*; and, that it is the ſpecies *ſativa*, I conclude from its flowers growing in pairs, its leaves conſiſting of about ſix pair of wings and

and terminating in a divided tendril; but the burnt ſpot under the *ſtipulæ* leaves no doubt that it is the common Vetch or Tare, which, you remember, Virgil mentions among the pulſe which are ſuppoſed ſo to fertilize the ground as to render fallowing unneceſſary.

Aut ubi flava ſeres, mutato ſidere, farra,
Unde prius lætum ſiliqua quaſſente legumen,
Aut tenues fœtus Viciæ, triſtiſque lupini
Suſtuleris fragiles calamos, ſylvamque ſonantem.

Do not you think that *ſidere*, in the firſt line, ſhould be *ſemine?*

Suppoſe we now examine one of theſe *Ranunculi*, commonly called Crowfeet or Butter-cups. You perceive immediately that it is of the Claſs *Polyandria* and Order *Polygynia*. Its *calyx* conſiſts of 5 leaves, and its *corolla* of 5 petals, with a melliferous pore at the baſe of each; the ſeeds are naked. Theſe particulars form the eſſential generic character of *Ranunculi*. As to its ſpecies, the reflected *calyx*, the ſulcated *pedunculus*, the ſtalk erect, bearing many flowers, *Ranunculus.*

flowers, the bulbous root, and particularly its being now in bloom in this dry meadow, leave no doubt that it is the *Ranunculus bulboſus*, or bulbous Crowfoot.

Of this *genus* there are no leſs than 44 different ſpecies, 14 of which are natives of this iſland. That yellow flower, which you ſee on the ſwamp, is one of them: its trivial name is *ſeleratus*, from the reſemblance of its lower leaves to thoſe of Celery. It is very eaſily diſtinguiſhed by the remarkable thickneſs of its ſtem, which is hollow like a reed; by its minute flowers, and the conical ſhape of the *receptaculum*. This ſpecimen, you ſee, is full two feet high. It ſeldom grows ſo tall.

Look this way and you will ſee among that corn, a moſt plentiful crop of other *Ranunculi*. Theſe, you obſerve, have alſo a ſmall flower, but of a paler yellow and numerous. The leaves are deeply divided and ſubdivided, ſo as to form a number of narrow ſtraps. This circumſtance, and its prickly ſeeds conſtitute its ſpecific character. Its common height is about a foot, though that you have gathered meaſures 17 or 18 inches. It is the *Ranunculus arvenſis*.

On

On this turf, between the corn- *Orchis.*
lands, you ſee ſcattered a few beautiful purple flowers, which, at a diſtance, look ſomewhat like garden hyacinths. But, you now perceive, that the *corolla* is of a very different ſhape. It reſembles no flower that we have hitherto examined.

As it is neceſſary to begin your inveſtigation by aſcertaining the Claſs, you muſt diveſt the plant of its petals. You now diſcover that the *ſtamina* are fixed to the *ſtylus*, or rather to a *nectarium* which ſupplies the place of a *piſtillum*. Your plant therefore is of the 20th Claſs, *Gynandria*, for a particular deſcription of which I refer you to your *Clavis*. The *ſtamina* are two, therefore it is the firſt Order, *Diandria*; for in this Claſs, the Orders depend on the number of *Stamina*, and not on the *Piſtilla*, as in many of the preceding Claſſes.

Now as to the *genus*, you ſee there is a *nectarium*, in the ſhape of a horn, behind the flower. This circumſtance tells you that it muſt be an *Orchis*, and the undivided bulbs of its root; quadrifid, ſcallopped lip of the *nectarium*; the obtuſe aſcending horn, and the obtuſe conniving petals, convince you,

you, that it is the *Orchis morio*, or Meadow Orchis. The *genera* in this Order are diſtinguiſhed by the ſhape of the *nectarium*.

Of this *genus* there are in all 50 ſpecies, ten of which have been found in Britain. You will find a good engraving of this plant in the *Flora Londinenſis*.

Vale.

LET-

LETTER XXIX.

JUNE.

Nunc frondent ſylvæ, nunc formoſiſſimus annus.

TO ſpeak in the language of a ſportſman, this month will afford us ample diverſion. We ſhall find no lack of Game. Herbarizing may indeed, with ſome propriety, be compared with the amuſements of the chaſe. A botaniſt is continually hunting; but with this very great advantage, that his ſport is unmixed with cruelty. Happily the objects of his purſuit have no feeling: they are unconſcious of their exiſtence, to deprive them of it, therefore, cannot be attended with remorſe.

Pull that yellow flower with two heads. Each head, you perceive, is a cluſter of diſtinct florets of what is called a papilonaceous ſhape. You conclude, therefore, that we muſt look for it in the Claſs *Diadelphia*. Indeed this butterfly-appearance of the flower is a much more obvious and invariable criterion of the Claſs, than the *ſtamina* being united in two ſets, or brotherhoods as the title implies; but Linnæus's ſyſtem would

would not ſuffer him to make the *corolla* characteriſtic of a Claſs. It is however a perfectly natural Claſs, comprehending the *Papilionacei* of Tournefort, the *Irregulares tetrapetali* of Rivinus, and the *Ligumenoſæ* of Ray.

Anthyllis. Almoſt all the plants of this Claſs are of the Order *Decandria*; you will accordingly, on a minute inſpection, find ten *ſtamina* in each of thoſe ſmall flowers. In running over the generic characters, there is nothing to cauſe any heſitation till you come to *Anthyllis: calyx ventricoſus*; but the *calyx* in this genus is not only ventricoſe, but woolly. This agrees well with the plant you have gathered; and, in the ſpecific character of the only ſpecies in this kingdom, Linnæus ſays, *foliis pinnatis inæqualibus, capitulo duplicato.* Theſe circumſtances may convince you, that you hold in your hand the *Anthyllis vulneraria*, or Ladies-finger. If you have any doubt, I muſt refer you to Relhan's very accurate deſcription of this ſpecies; where among other marks of diſtinction, you will find —

Caules

Caules teretes, pubeſcentes. Flores ſeſſiles in majori capitulo 20. *Corolla flava.* Now I hope you are ſatisfied.

There is a ſhrub in that hedge that will remind you of a line in the ſecond Georgic. *Cornus.*

At myrtus validis haſtibus, et bona bello Cornus.

Examine the flower. *Tetrandria Monogynia.* The coralla, you obſerve, ſtands above the germen, and conſiſts of four regular petals. Now turn over your *Synopſis.* You find it muſt be in the fourth diviſion. The firſt plant is the *Cornus*, with an *involucrum* of 4 leaves, and a *perianthium* of one, with 4 teeth. The *corolla* is leſs than the *involucrum*, and ſhorter than the *ſtamina.* Theſe eſſentials quadrate with that flower: therefore you can have no doubt as to the *genus*; and as you learn, from your *Flora Cantabrigienſis*, that there is but one Species in this county, your ſhrub muſt neceſſarily be the *Cornus ſanguinea*, or Dogberry; a ſhrub which merits ſome veneration, were it only for being Godfather to an admirable character in *Much-ado about nothing.* Honeſt Taſwell! *I ne'er ſhall look upon thy like again!*

Gar-

Garrick in Benedick was not a jot ſuperior to Taſwell in Dogberry. With what genuine appearance of ſtupid ſimplicity he exclaimed — *O that he were here to write me down an aſs!*

But to return to our *Cornus*. It is certain, that the Romans made their ſpears of Myrtle and Cornel, though, from a paſſage quoted by Martyn in his Commentary on the Georgics, it appears that Pliny preferred the Aſh.

Conium. That tall umbelliferous plant, with dark-green gloſſy ſubdivided leaves, and white flowers, claims your particular attention. It is the famous Hemlock, which on the credit of Profeſſor Storck of Vienna, was ſuppoſed an infallible cure for cancers. The number of *ſtamina* and *piſtilla* declare it to be of the Claſs and Order *Pentandria, Digynia*. Its former generic name was *Cicuta*, but Linnæus chuſes to call it *Conium*, and *maculatum*, from the ſpots on the ſtem. Why this *Cicuta* of all other botaniſts, muſt have its ancient name taken from it and transferred to a different plant, I do not comprehend: nor

nor do I know where he got the word *Conium*; unleſs from Pliny, who, I think, mentions it as the name of a town in Phrygia. This our Hemlock was certainly the *Cicuta* of which the pipe preſented by Menalcas to the ſhepherd Mopſis, was made.

Hęc te nos fragili donabimus ante cicuta.

I myſelf, when a boy, have often made pipes of it: they had but few notes indeed, but the tone was not unlike that of the Clarionet.

This *Conium macalatum* is diſtinguiſhed from other plants of the ſame Claſs and Order, by the *involucella* extending only half round the ſpoke on which it ſtands, and conſiſting generally of three leaves, or rather of 3 diviſions of one leaf; and by the ſhape of the ſeed, which is nearly ſpherical, with 5 ſtriæ, and notched at each end. There are four *ſpecies* of this *genus*, but the *maculatum* only is indigenous in Britain. You may eaſily know it by the brown ſpots on the ſtem, and the gloſſy dark-green leaves. You ſee it is a tall plant: this ſpecimen meaſures, at leaſt, 5 feet.

Sambucus. There is a large plant with a bushy purplish flower, under that hedge. It bears some resemblance, both in leaf and blossom, to the common Elder-tree. It is indeed very nearly allied to it. We call it in English, Dwarf Elder, or Danewort, because, we are told, that it first sprang up in this kingdom from the blood of the Danes that were massacred here. It is the *Sambucus ebulus*, with the purple juice of whose berries, Pan, in Virgil's tenth Eclogue, is supposed to have smeared his face.

Pan deus Aracadiæ venit, quem vidimus ipsi,
Sanguineis Ebuli baccis minioque rebentem.

If you examine the flowers, you will find it to be of the Class and Order *Pentandria Trigynia*, and of that division in which the *corolla* stands above the germen. Its generic character is — *Calyx* and *Corolla* of 5 segments; berry containing three seeds. As to the species, there can be no difficulty, because there are but two, and one of these is a tree. You will find a good engraving of this plant in the *Flora Londinensis*.

Now

Now turn your attention to thoſe yellow flowers, like ſmall buttons, that grow ſo plentifully among the graſs. It ſomewhat reſembles the flower of the Hop, but is much leſs. You would ſuppoſe it a Trefoil: it is indeed naturally of that family: it is a *Medicago*, which differs from the *genus* Trifolium in the *carinæ* of the *corolla* being preſſed down from the *vexillum*, and particularly in its pod being compreſſed and ſpiral. The ſhape of the florets that compoſe theſe yellow heads, and the number of very minute *ſtamina* will inform you that it is of the Claſs and Order *Diadelphia Decandria*, and the ſpecies, *lupulina*, is determined by the ſpikes being oval, the pods reniform, containing a ſingle ſeed, and the ſtems trailing. Former botaniſts called this plant *Medica:* Linnæus choſe to call it *Medicago*. *Medica-go.*

Whether Virgil meant this ſpecies may be doubtful: however the *Medica* is among the plants which he adviſes to be ſown in the Spring.

Vere favis ſatio; tum te quoque Medica putres
Accipiunt ſulci.

Pliny ſays it was called *Medica*, from Media the country whence it was brought into Greece: — *Medica externa, etiam Græciæ, ut a Medis advecta per bella Perſarum, quæ Darius intulit* — If you be curious to know more of this plant, I refer you to Martyn's Georgics. He thinks Virgil meant our Lucern.

Hyoſcyamus. You obſerve, among that rubbiſh, a large plant, with dark buff-coloured flowers of a ſingular appearance. You find it has five *ſtamina* and one *piſtillum:* you have therefore no doubt as to the Claſs and Order. The *corolla* is funnel-ſhaped and obtuſe; the *ſtamina* are inclined, and the *capſula* is bilocular and covered. It is therefore an *Hyoſcyamus*; and though there be ſeven *ſpecies* of this *genus*, yet as the *niger* is the only ſpecies in this kingdom, it can be no other than our common Henbane. It is very eaſily known by the mixture of deep purple and buff in the

the flower. The Henbane is generally conſidered as a poiſonous plant. It was ſome time ago recommended as a ſubſtitute for *opium*.

That humble yellow flower, which adorns the ſides of this path, I ſuppoſe, you conſider, as a common *butter-cup*, beneath your notice. But you will find, on examination, that it belongs to a very different Claſs: and ſurely its beautiful ſilver-feathered leaves merit ſome attention. The *ſtamina* you find are about twenty. Hence you might doubt whether it does not belong to the Claſs *Polyandria*; but if you examine the five petals, you will find that they are fixed, not to a *receptaculum*, but to the *calyx*, which is monopetalous; ſo that it is of the Claſs *Icoſandria*. Now you obſerve in the centre of the flower, a numerous collection of ſmall buds, forming a knob, with ſtyles: therefore it is of the Order *Polygynia*. The leaves, you ſee, are pinnated, and ſerrated; the ſtem creeps, and the ſtalk bears a ſingle *Potentilla.*

flower. To this we may add, from Relhan, that there are from ten to twelve pair of wings in each leaf, decreaſing in ſize towards each extremity. Theſe circumſtances, with the ſilver whiteneſs of the under ſide of the leaves, leave no doubt that it is the *Potentilla anſerina*, or Silver Weed, called alſo wild Tanſey.

Scandix. You obſerve, among the corn, a weed with a ſmall white flower, and ſeveral long beaks, which you muſt ſuppoſe contain the ſeeds of the plant. By theſe long beaks you will eaſily diſtinguiſh it in future. Its generic name is *Scandix*, and from the ſuppoſed ſimilitude to the teeth of a comb, the ſpecific appellation is *pecten*. Our botanical predeceſſors have called it Shepherd's-needle, or Venus-comb. If you examine the flower, you will find it of the Claſs *Pentandria* and Order Dygynia. Theſe teeth of the comb are generally about an inch in length. Probably the combs of the ancients were of a rude conſtruction.

Vale,

LET-

LETTER XXX.

JUNE.

LET us take this left hand road to the Hills: we ſhall probably meet with ſome new objects.—That upright ſlender plant, with a ſingle ſimple ſtem, thick ſet with very ſmall pointed leaves, and terminated by a tuft of beautiful blue flowers, is the *Linum perenne*, or perenniel blue Flax. The five petals will fall off almoſt as ſoon as you touch them. You will then diſcover five *ſtamina* and the ſame number of *piſtilla*. *Pentandria Pentagynia*, therefore, is the Claſs and Order. That it is a *Linum*, I know, from its pentaphyllous *calyx*, its pentapetalous *corolla*, its quinquevalve capſule, and its ſolitary ſeeds; and, that it is the *perenne*, I learn, from the ſegments of the calyx being obtuſe, the leaves on the ſtem numerous, ſmall, alternate, and by the flowers growing in a tuft. *Linum.*

We have, in Britain, five ſpecies of *Linums*, as you will find in your *Synopſis*. No. 1.

uſitatiſſimum, grows to the heighth of three feet; its ſtem is branched, and each branch terminated by a blue flower. No. 2. is the plant in your hand. No. 3. *tenuefolium*, is diſtinguiſhed by its ligneous, numerous ſtems, and a ſmaller flower. No. 4. *catharticum*, is a ſmaller plant, with four or five bent ſtems, with leaves diſtant and oppoſite. Its flowers are white and minute. No. 5. *radiola* has four *ſtamina* and the ſame number of *piſtilla*, and therefore belongs to another Claſs.

The ancients were univerſally of opinion that a crop of Flax impoveriſhes the ground. I am ſure you recollect this line in the firſt book of the Georgics.

Urit enim Lini campum ſeges, urit avenæ.

Hedyſarum. You obſerve there a flower of a full fleſh-colour, growing on a long ſtalk. You perceive it is formed by a number of florets imbricated ſo as, in ſome degree, to reſemble the head of a cock. Our botanical predeceſſors have therefore called it Cock's-head. It is the *Hedyſarum onobrychis*. From the external appearance of the bloſſom,

bloſſom, you pronounce it to be of the Claſs *Diadelphia*; and, if you examine the ſtamina, you will place it in the Order *Decandria*. But, on a more minute inveſtigation, you will be ſurpriſed to find only two petals in the flower, viz. the *vixillum* and the *carina*, and that there is no appearance of wings. Nevertheleſs, if you apply your glaſs, you will diſcover two minute, pale fleſh-coloured *alæ*, which, in compliance with this artificial ſyſtem, may be tranſlated *wings*.

This *genus* of *Hedyſarum* depends on the *carina* being tranſverſe and obtuſe, and on there being a ſingle ſeed in each joint of the pod. There are in all no leſs than 67 *ſpecies* of this *genus*, only one of which is found on this iſland. It is particularly diſtinguiſhed from the reſt, among thoſe with pinnated leaves, by its elongated ſtem; but this ſtem is rather a long *ſcapus* or ſtalk, proceeding from a ſhort *caulis*, or ſtem. For a definition of theſe terms I refer you to your *Clavis*.

There

Poly-gala. There is a humble plant, growing in patches, with a blue flower, that merits your attention; becauſe it is the only *genus* indigenous in this kingdom, of the Order *Octandria* in the Claſs *Diadelphia*. It is the *Polygala vulgaris*, or Milkwort. It grows, you ſee, ſomewhat in the manner of that Thyme, its frequent companion on theſe hills; from which however it differs eſſentially, as you will find when we have examined them both.

Having now, by inſpecting the ſtamina, determined the Claſs and Order, and knowing that in theſe there is but one ſpecies of one genus, diſcovered in this kingdom, you know the plant without either generic or ſpecific deſcription. For greater certainty, however, you may obſerve, that the *calyx* is pentaphyllous, and that two of its leaves look like coloured wings. The ſtem, you ſee, is proſtrate, branched, curved and from 4 to 6 inches in length.

Thymus. It is now *time* (without a pun) to take notice of its neighbour, the *Serpyllum* of all the Botaniſts before Haller, who,

who, I believe, firſt called it *Thymus*. The *ſtamina*, you obſerve, are four, two long and two ſhort; therefore it is of the Claſs *Didynamia*, and the ſeeds being naked tells the Order to be *Gymnoſpermia*. The generic character is a very ſhort one—*Calycis bilabiati faux villis clauſa*, and it is ſufficiently diſtinguiſhed from the only other *ſpecies*, in this kingdom, by its flowers being collected in a head; thoſe of the *acinos*, or Baſil Thyme, are verticillate.

This Thyme, you know, both Greek and Latin poets ſuppoſed the favorite food of bees. Virgil therefore mentions it as a proper herb to be planted near the hives.

Hæc circum Caſiæ verides, et olentia late
Syrpylla.

This *Syrpyllum* of the Romans was the ἕρπυλλον of the Greeks, derived from ἕρπω, to creep. Theſe Romans, as Martyn obſerves, frequently changed the Greek aſpiration into S, from ἕρπω forming *ſerpo*, from ἑξ ſex, &c. But Virgil, both in his Eclogues and Georgics, mentions alſo *Thymus*, which Linnæus adopts as the name of the genus.

Dum

Dum juga montis aper, fluvios dum piſcis amabit,
Dumque Thymo paſcentur apes, dum rore cicadæ,
Semper honos, nomenque tuum, laudeſque manebunt.

Theſe beautiful lines, you remember, are at the concluſion of the very ſublime *apotheoſis* of Daphnis, ſuppoſed to be Julius Cæſar, ſung by Menalcas in the fifth Eclogue: and, in the fourth Georgic,

Ipſe Thymum pinoſque ferens de montibus altis
Tecta ſerat late circum, cui talia curæ.

This *Thymum* of Virgil is ſuppoſed to be, not our common Thyme, cultivated in our gardens as a pot-herb, but that ſpecies which Ray calls *Thymum legitimum*; that ſpecies to the abundance of which Sicily owed its celebrity for its honey, and which is found by travellers in every part of Greece—*Bollonio auctore*, ſays Ray, *ita frequens in tota Grecia reperitur, ut nulla herba in montibus facilius proveniat.*

Theſium. That diffuſe plant with ſmall whitiſh flowers on looſe leafy panicles, is the *Theſium linophyllum*, of which, as a rare plant, Relhan has given a plate. Its Engliſh name is baſtard Toadflax. You will

will find, it has no *corolla*; the flower consisting of a *calyx* only, into which the five *stamina* are inserted.

Not far from us, I perceive another scarce plant, of which my friend Relhan has given a plate and an accurate description, in his excellent *Flora Cantabrigiensis*. I mean that diminutive chap, about five inches high, with a yellow star-flower. It is the *Cineraria alpina*, or Mountain Ragwort. There are some doubts about the proper *genus* of this herb; but Linnæus has declared that it is a Proteus of a plant. It is of the Class and Order, *Syngenesia Polygamia superflua*. The flowers, you observe, grow in a loose irregular kind of umbel, and the leaves on the stem are lance-shaped, woolly, and very erect.

It is now time to descend the Hills,

—jam summa procul villarum culmina fumant,
Majoresque cadunt altis de montibus umbræ.

Our rout lies through Cherry Hinton, a village celebrated in the annals of Botany, by having been the scene of our indefatigable Ray's frequent herborizations; particularly in a field called the *Chalk-pit close*, where Rel-

Relhan firſt ſhewed me the *Athamanta libanotis*; a ſcarce plant, which, ſince the time of Ray, had been entirely loſt. We ſhall viſit this field another time.

You are delighted with the fragrant effluvia of this narrow lane. It is the fragrance of roſes. That ſhrub, with white flowers, is the *Viburnum opulus*, or Guelder Roſe; and the other is the *Roſa canina*, or Dog Roſe. If you examine the *cymæ* of the firſt, you will find that the ſmall flowers in the centre have five *ſtamina* and three minute ſtigmata, and that the large flowers in the *radius* have neither.

The *Roſa canina* is of the Claſs *Icoſandria Polygynia*. You will find, in your *Synopſis*, that it is of the firſt *genus* in that Order, and that there are five ſpecies in this iſland.

Lotus. There is a yellow flower that we have frequently ſeen in our walks, but of which we have hitherto taken no notice. By the leaves you would ſuppoſe it a Trefoil. Indeed its Engliſh name is Birdsfoot Trefoil. Linnæus calls it *Lotus corniculatus*. You will determine the genus by its turbular *calyx*, the wings of the *corolla* conniving longitudinally

gitudinally upwards, and, hereafter, by the pod being cylindrical, ſtiff, and longer than the *calyx*. We have but one ſpecies of this genus, which is characterized by the flatneſs of the heads, and the ſtem being decumbent. You will find a good plate of this plant in *Curtis*.

Thoſe fine ſcarlet, and thoſe tall blue flowers, equal in colour to the beſt *ultramarine*, and which add ſo much to the beauty of this field of green corn, are too conſpicuous to paſs unnoticed. The ſcarlet flower, you tell me, is a Poppy.—It is ſo; but I wiſh to know ſomething more about it. The *ſtamina*, you perceive, are numerous, and there is, in the centre, a *germen* covered by a *ſtigma*, but no *ſtylus*. Hence I know the Claſs and Order to be *Polyandria Monogynia*. The generic character is—*calyx* diphyllus; *corolla* tetrapetala; *capſula* unilocularis, ſub ſtigmate perſiſtente poris dehiſcens. The plant you have gathered is the *Papaver rhœas*; it is particularly diſtinguiſhed *Papaver.*

guiſhed from the other three red Poppies, which alſo grow in corn-fields and bloom at the ſame time, by its round ſmooth head, hairy ſtem and pinnatifid leaves.

We have in this kingdom ſix ſpecies of *Papaver*, one of which has white and another yellow flowers. I doubt whether any of thoſe be the ſort that was ſown for ſome purpoſe or other, by the ancients, and which, Virgil ſays, burns the land,

Urunt lethæo perfuſa papavera ſomno.

Centaurea. That tall plant with the beautiful blue flower, you will find, is of the Claſs and Order *Polygamia Fruſtrania*. The *floſculi* that form the *radius*, you perceive, have no *ſtigma*, and for that reaſon can produce no ſeed; they are therefore of no uſe in the propagation of the plant: that operation is performed by the florets of the diſk, which are hermaphrodite. —Having thus aſcertained the Claſs and Order, conſult your *Synopſis*, and you will have no doubt of the *genus*, *Centaurea* being the only genus indigenous

genous in Britain. As to the *ſpecies*, it is evidently the *cyanus*, or blue-bottle, becauſe there is no other with a blue flower.

There is, on the verge of thoſe lands, another ſtately plant with blue flowers, of which probably you have never heard the name. It is a handſome flower to look at, but not very pleaſant to touch; its ſtem being thick ſet with white briſtles, each of which, you will perceive, grows on the centre of a brown tubercle. Its five red *ſtamina* and forked *piſtillum*, are eaſily ſeen, as they project much beyond the rim of the *corolla*. Its common height is about two feet. The flowers, you ſee, crowd all to one ſide of the ſpike, which is generally from ſix to nine inches in length. The leaves on the ſtem are ſeſſile, hairy and ſpear-ſhaped. Theſe together are ſufficient marks of diſtinction. It is the *Echium vulgare*, or Viper's Buglos. But I muſt appriſe you that the flowers on the ſpike being lateral, that is, growing all on one ſide, *Echium.*

is so far from being general, that they more commonly form a regular pyramid.

Liguſtrum. In that hedge you obſerve a ſhrub with a white flower, which I dare ſay you know to be the Privet, having often ſeen it form a regular hedge in gardens; to which purpoſe it is indeed well adapted. You will find it in the *Synopſis*, the firſt *genus* in the Claſs and Order, *Diandria*, Monogynia: accordingly, you ſee, in the flower two *ſtamina* and one *piſtillum*. The generic name is *Liguſtrum* and the ſpecific *vulgare*. The word *Liguſtrum* reminds you of theſe lines in Virgil,

O formoſe puer, nimium ne crede colori:
Alba Liguſtra cadunt, vaccinia nigra leguntur.

It is however by no means certain, that theſe *alba liguſtra* of Virgil were what we call Privet: on the contrary, many commentators are of opinion, that our *Convolvulus ſepium*, Great Bindweed, is the plant; and they incline to this opinion from the extreme

extreme whiteneſs of the flower and the ſuppoſed derivation of *Liguſtrum* from *ligando*. Pliny poſitively ſays it is a tree: but Pliny was a mere tranſcriber, and, I am,

dear Charles,

Your, &c.

LETTER XXXI.

JULY.

" What calm joy can this exceed,
This of roving o'er the mead?
Where the hand of Flora pours
Sweeteſt voluntary flow'rs:
Where the Zephyr's balmy gale
Wantons in the charming vale."

Veronica. THAT plant, with theſe beautiful china-blue flowers, which grows ſo luxuriantly in the brook, is the *Veronica beccabunga*, commonly called Brooklime. It is of the Claſs *Diandria* and Order *Monogynia*. The flowers, you ſee, are *inferi*, *monopetali*, *et irregulares*. Both *calyx* and *corolla* are quadripartite, and, of the latter, the loweſt ſegment is the narroweſt: theſe particulars determine the *genus*. The *ſpecies* is known by its looſe lateral ſpikes of blue flowers, its creeping ſtem, and by its leaves being thick, ſeſſile, oval, oppoſite and notched.

That

That very common plant with large flowers, that grows ſo plentifully on each ſide of this road, you know, I make no doubt, is a ſpecies of Mallow. It merits your attention as an example of the Claſs and Order *Monadelphia Polyandria*, in which the claſſical character may be diſtinctly obſerved without the help of your glaſs. You ſee there are many *ſtamina* united below in one body or brotherhood. The *corolla* conſiſts of five petals. The calyx is double, with but three leaves in the exterior range, by which laſt circumſtance it is diſtinguiſhed from the *genus* Althea. We have in this kingdom four ſpecies of Malva, viz. *rotundifolia*, *parviflora*, *moſchata* and *ſylveſtris*, which laſt is the plant you have pulled, and which is diſtinguiſhed from the other three, by its leaves being waved, in 5 or 7 lobes, obtuſe, ſerrated and their foot-ſtalks hairy. *Malva.*

Here is a plant about two feet in height, with a ſmall blue flower, from the gaping appearance of which, you ſuppoſe it to be of the Claſs *Didynamia*; *Salvia.*

but its unfortunate want of two more ſtamina, ſeparates it from its family. If you examine the flower, you will find it contains one piſtillum and two very diſtinct *ſtamina* with large *antheræ*, which you perceive have burſt longitudinally on the under ſide, and are now in the act of diſcharging, in great profuſion, a fine yellow *pollen*, on the ſummit of the *piſtillum*; but, being naturally taller than the *ſtamina*, it bends its neck down between the ſtamina, for the purpoſe of receiving this yellow duſt. Yet Linnæus, as a generic character ſays—*Filamenta tranſverſe pedicello affixa*; and Dr. Withering tells us, that the rudiments of two chives appear in the mouth of the bloſſom, but they have no tips. In this ſpecies, however, nothing can be more conſpicuous than the ſtamina and *tips*, as he chuſes to call them; and, as to the filaments fixed tranſverſely to a pedicle, there is not the leaſt appearance of it. In this *ſpecies*, you obſerve, the flowers grow in whirls, ſix in each; the leaves are wrinkled, ſcallopped and ſerrated, on the upper part of the ſtem ſeſſile, on

the

the lower on pedicles. The ſtem is quadrangular and *brachiatus*. Relhan ſays it ſmells like black currants: to me, it has rather a mixt pot-herb ſmell. It is the *Salvia verbenaca*, Wild Sage, or Clary. There is another ſpecies, viz. *S. pratenſis*, found in other counties, which is rather a ſcarce plant. This *Salvia verbenaca* you will find, in great plenty, in the field path oppoſite the horſe-bridge of Trinity College.

Api-um.

In that ditch I ſee an umbelliferous plant, which, if you can get at it without a plunge, you will find to be of the Claſs and Order *Pentandria Digynia*.—It is the *Apium graveolens*, the eſſential character of which *genus* is, Seeds oval and ſtriated; *involucrum* of one leaf: petals equal. But ſeeds yet there are none, and as to the *involucrum* according to its arrangement in the *Syſtema Vegetabilium*, it ought to have none. You may, however, diſtinguiſh it by the general umbel conſiſting of few *radii* and the partial of many. Linnæus dertermines the *ſpecies* by the leaves on them being wedge-ſhaped.

We call it, in its wild ſtate, Smallage; in our gardens Cellery. It is probably the ελειοσελινον of the Greeks; for their σελινον the Latin writers always tranſlate *apium*. From the ſituation in which you have found it, we may, I think, rationally ſuppoſe it to be Virgil's *Apium*.

Quoque modo potis gauderent intuba rivis,
Et virides apio ripæ —

Cichorium. There grows the very *Intubum* juſt mentioned. I mean that plant with large blue flowers, like wheels, growing, without foot-ſtalks, on the ſide of a zig-zag ſtem, which is firm and about two feet high. If you examine the calyx you will find it double; the interior formed of 8 ſcales, the exterior of 5, which are fringed. The petals are in number from 16 to 20, with 5 notches at the extremity of each. *Linnæus* calls it *Cichorium intybus*. It is of the Claſs and Order *Syngeneſia Polygamia æqualis:* in Engliſh, Succory. I take it to be the ſpecies of σεριις, which Dioſcorides

corides calls πικρις. It is certainly the weed, injurious to the farmer, which Virgil ſo drolly links with the geeſe and cranes.

—— *nihil improbus anſer*
Stramoniæque grues, et amaris Intuba fibris
Officiunt.—

Poſſibly it was this ſpecies of *cichorium* that made a part of Horace's ſallad,

—— *Me paſcunt olivæ,*
Me cichorea, leveſque malvæ.

And that, by *olivæ*, he meant the oil which he eat with it. But it is more probable, I think, that he ſpeaks of the *Cichorium endivia*, the plant which we call Endive: and yet, if he could eat mallows, he might alſo eat Succory.

Near the plant you have juſt examined, there is another more univerſally common, and which, as you will find in your *Synopſis*, immediately follows the *Cichorium*. It is the *Arctium lappa* of Linnæus, our Burdock, or Clotbur; the famous *Bardana* of the famous Dr. Hill. *Arctium* is the ancient *Arctium.*

cient name by which it was called by Dioſcorides. Later botaniſts have given it the name of *Lappa*, probably from λαμβανω, *capio*, from its catching hold of people's garments as they paſs. Linnæus took the Dioſcordian name for the *genus*, and *Lappa* for the *ſpecies*. It is of the Claſs and Order *Syngeneſia*, *Polygamia æqualis*. Its *medium* height is between two and three feet. The flowers are purple, on the top of a large, globular imbricated common *calyx*, the exterior ſcales of which are ſharp and hooked, ſo as to catch faſt hold of every thing they touch. Whether Virgil, enumerating the weeds that infeſt the corn-fields, meant this Burdock, or the *Galium aparine*, is matter of contention among his commentators,

——— *ſubit aſpera ſylva,*
Lappæque, Tribulique ——— Geor. I. 52.

Be this as it may, the *Lappa* of Pliny is certainly the *Aparine* of Theophraſtus and Dioſcorides. You will find this ſubject learnedly diſcuſſed in Martyn's Virgil.

You

You look inquiſitively for the cauſe of the ſweet honey-like ſmell you perceive. It proceeds from thoſe ſpikes of ſmall yellow flowers that border this field. If you apply your glaſs to any one of them, you will find it is of the Claſs and Order *Tetrandria Monogynia*. The *calyx*, you obſerve, is ſmall, of one leaf, with four teeth; the *corolla* monopetalous, plane, without tube, divided into four ſharp ſegments. The fruit conſiſts of two dry berries, containing each a ſingle ſeed: therefore it is a *Galium*. The branches which ſupport the ſmall ſpikes are very ſhort. The leaves on the ſtem grow in whirls, are ſhort, linear, ſharp, brittle, ſulcated, and eight or nine in number. The ſtem is brown and ſquare: therefore it is the *Galium verum*, Ladies Bedſtraw, or Cheeſe-renning. *Galium.*

We are told by Mr. Pennant and by Mr. Lightfoot, that in the iſles of Jura, Uiſt, Lewis, &c. they uſe the root of this plant for dying red, and that a decoction of the flowers is uſed in the iſle of Aran, and in Cheſhire, to curdle milk for cheeſe. You will

will find an excellent engraving of this plant in the *Flora Londinenſis*.

We have hitherto taken no notice of that prolific tribe of plants to which, we of the temperate zone, are principally obliged for a conſiderable part of our food, our raiment, and for this perpetual verdure, ſo grateful to the eye. I need not tell you, that I mean the Graſſes. You will probably aſcribe our neglect of them to their not bearing flowers, which have always been the objects of our enquiry. But this is not true. Their flowers indeed are neither large not gaudy; nevertheleſs it is from their parts of fructification, as in other plants, that they are claſſed in the Linnæan ſyſtem. They are difficult of inveſtigation, becauſe the eſſential parts are ſo minute as to require good glaſſes, and more time than you can now ſpare: for this reaſon, we have ſuffered the Graſſes to paſs unnoticed. I ſhall, however, give you a general idea of their conſtruction, and you may purſue the ſubject when you have more leiſure.

Lolium. The natural characters of Graſſes are: Stem, Culm, or Straw, ſtraight, ſim-

ſimple, fiſtular and jointed: *Calyx*, a huſk of two valves: *Corolla*, if it may be ſo called, a dry, ſkinny huſk, alſo of two valves: *Stamina* three: *Piſtilla* two. Seeds, ſingle, pointed at each end: Leaves, one at each joint, entire, narrow, tapering to a point. But theſe characters are not invariable, as you will ſee in this ſpecimen in my hand, which when I tell you its generic name, you will recollect is mentioned by Virgil more than once. It is the *Lolium temulentum*, ſo called by Linnæus from the inebriating quality of its ſeed when malted with barley brewed.

In the Georgics you remember

——— *interque nitentia culta*
Infelix Lolium, et ſteriles dominatur avenæ.

And, in the 5th Eclogue, he repeats the laſt line verbatim. Whether he meant this particular ſpecies I know not. It is called, in Engliſh, White Darnel. If you examine it minutely you will find, that it differs from the general character of Graſſes, in its *calyx* being a huſk or glume, of one leaf.

The ſpecific character of this Darnel is:

Culm

Culm from two to three feet high: Spike bearded, flat, near a foot in length.

Virgil's *avena* in the verſe above quoted, was probably the *Avena ſtrigoſa* of Schreber, which Dr. Withering calls Scrannel graſs.

Onopordum. The magnificent plant, with purple flowers, growing on that dry bank, demands your notice on account of its ſtately appearance; but more eſpecially becauſe of its ſingularity. It is the only ſpecies, in this kingdom, of the genus to which it belongs. We call it a Thiſtle; but that appellation comprehends ſeveral diſtinct *genera* in the modern ſyſtem of botany. Our excellent botaniſt Ray, conſidered it as a *Carduus*, to which family it ſeems naturally to belong. Linnæus, after Haller, calls it *Onopordum*, with the ſpecific name *acanthium*. It is our Cotton-thiſtle, ſo called from the grey down that gives it this whitiſh appearance. It is eaſily diſtinguiſhed by its ſuperior ſubſtance and height; its decurrent leaves, or wings, on the ſtem and branches, and by its very large bottom

tom leaves. But its eſſential generic character is, that the *receptaculum*, reſembles a honey-comb, except that the cells are quadrangular, and the ſcales of the calyx ſtand open, and are ſharp pointed. The *receptaculum* and the young ſhoots peeled and boiled may be eaten like artichokes.

That Thiſtle about two feet high, with a purple flower, whoſe decurrent leaves terminate in a long ſharp ſpine, is the Spear-thiſtle. It is the *Carduus lanceolatus of Linnæus.* By this ſpear you will eaſily diſtinguiſh it. The eſſential character of the *genus Carduus* is: *Calyx* oval, imbricated, with ſpinous ſcales: *Receptaculum* hairy. *Carduus.*

That other plant with pale purple ſmall flowers, which you would naturally call a thiſtle, is according to Linnæus, not a *Carduus*, but a *Serratula*. It differs from a *Carduus*, in the *receptaculum* being ſub-cylindrical, and not ſpinous. It is the *Serratula arvenſis*; in Engliſh, Corn-ſaw-wort, *Serratula.*

wort, or Way-thiſtle. Its flowers, which have an agreeable ſmell, you obſerve, grow in a kind of looſe umbel, on long peduncles, and that the entire plant is of a pale green. This is probably the Thiſtle which Virgil reprobates in the following lines,

—ſegniſque horreret in arvis
Carduus.

It is indeed the moſt prolific, and difficult to eradicate, of any pernicious weed that infeſts our corn-fields. It is impoſſible to extract it with breaking every fibre of the root, which Curtis thus deſcribes—*Radix perennis, teres, craſſitie fere digiti minimi, ſordide albida, profunde deſcendens, repens, undique longiſſime ſe protendens.* Diſſatisfied with Linnæus's arrangement of this plant, he reſtores it to the *genus* Carduus, to which it naturally belongs. He gives it the Engliſh name of Curſed Thiſtle, "to awaken," as he ſays, "the attention of the agriculturiſt, to its nature and pernicious effects."

We muſt not quit this family—I ſay family; for though arbitrary ſyſtems may change their names, their natural affinity will

will remain—without taking notice of the moſt beautiful among them. I mean that Thiſtle whoſe leaves are variegated with irregular broad white veins. It is the *Carduus marianus* or Milk Thiſtle, or Lady's Thiſtle. The old German Botaniſts called it *Carduus Mariæ*—that is, of the *Virgin* Mary: ſo our old black-letter Botaniſts call it *Our Lady's Thiſtle.* As the Galaxy, or Milky-way, in the Heavens was cauſed by the overflowing milk of a Goddeſs, ſo the milk veins on this Carduus, were the effect of a ſimilar redundancy in the breaſt of the Virgin Mary, according to the fabulous mythology of the ancient Catholics. Theſe white veins ſufficiently diſtinguiſh this ſpecies; but ſometimes they are wanting: in that caſe, you muſt attend to the large thorns, beſet with a few ſmall ones, which guard the *calyx.* You may likewiſe obſerve, that there is a ſingle head on the top of each branch; that there is no leaf near it, and that the leaves embrace the ſtem.

I ſuppoſe you are now ſo much a botaniſt, that it is almoſt unneceſſary to tell you that theſe Thiſtles are of the Claſs and Or-

der *Syngeneſia Polygamia æqualis:* the *floſculi*, you obſerve, are all turbular and hermaphrodite.

Adieu.

LET-

LETTER XXXII.

JULY.

YOUR objection to this Sexual Syſtem of Linnæus, carries more weight upon reflection, than might, at firſt, be ſuppoſed. The lady who aſked the queſtion, "whether women may be inſtructed in the modern Syſtem of Botany, conſiſtently with female delicacy?"—was accuſed of ridiculous prudery; nevertheleſs, if ſhe had propoſed the queſtion to me, I ſhould certainly have anſwered—"They cannot."

The late Dr. Hope, Profeſſor of Botany at Edinburgh, was naturally a very modeſt man. I have frequently ſeen him embarraſſed under the neceſſity of explaining the analogy between the parts of generation in plants and animals, to an audience of young pupils. How much greater would have been his embarraſſment, if his pupils had been females!—It is true, the terms are Latin, or of Latin derivation; and it is alſo true, that there is nothing indecent in their literal meaning; but, unleſs we explain their analogy, the Sexual Syſtem does not appear.

The idea of male and female plants, is of very ancient date. The penetrating, the inquiſitive genius of Linnæus, purſued the idea, ſaw its want of preciſion, diſcovered the ſexual diſtinctions, and made them the foundation of a beautiful philoſophical hypotheſis. But this hypotheſis might have been confined to Philoſophy. The analogy between the parts, and the propagation, of plants and animals, was of no uſe in a practical ſyſtem of Botany. Five *ſtamina* and one *piſtillum* would ſufficiently aſcertain the Claſs and Order *Pentandria Monogynia*, which might with great eaſe have been otherwiſe denominated, ſo as to have no reference to ſex.

In an age leſs refined than the preſent, theſe objections were invalid. Poſſibly we may not be more virtuous than our progenitors; but doubtleſs we are more delicate. The *double entendres* in the comedies of the laſt age, with which the then audience were ſo much delighted, would now be received with diſguſt: and, what is very remarkable, though we are, by no means, eſteemed the moſt poliſhed nation, we are certainly the moſt delicate. Some years ago, I was preſent, on a Sunday evening, at the repreſentation

ſentation of a French comic Opera, at Bruxelles. One of the ſongs was at leaſt *treble entendre*, and in another, (a *duetto* between a man and woman) he made ſeveral attempts to put his hands in the girl's boſom. I believe, this would hardly have been ſuffered at Bartholomew-fair.

The French have the reputation of a highly poliſhed people. This reputation may be juſt: nevertheleſs they are indelicate; ſo extremely indelicate, that, paradoxical as it may ſeem, even their modeſt women are diſguſtingly immodeſt. A modeſt Engliſhwoman is the moſt modeſt woman in the world. If the ſtage be the juſt criterion of the manners of a nation, we are, at this time, ſuperior in point of public chaſtity.

The ſweet ſmell that you perceive in this avenue proceeds from theſe tall trees, which are now in bloom. They are the *Tilia europæa*, Lime-trees, of the Claſs and Order *Polyandria Monadelphia:* you will accordingly find, in the flower, many *ſtamina* and one *piſtillum*. The *corolla* is pentapetalous and the *calyx* quinquepartite. The ſpecies is *Tilia.*

diſtinguiſhed by its want of a nectarium, and by the ſingular pale-green ſtrap, called a *bractea*, annexed to the pedunculus, that ſupports an umbel of from three to ſeven radii, with one flower at the extremity of each. The leaves, you ſee, are heart-ſhaped and finely ſerrated. Virgil celebrates this tree for the lightneſs of the wood.

——*Tilia ante juga lævis.*

Paſtinaca. That tall umbelliferous plant, which grows ſo profuſely on the border of this field, I ſee, attracts your particular notice. You have hitherto ſeen no plant of this ſtructure whoſe flowers were yellow; and that circumſtance is alone ſufficient to inform me that it is the *Paſtinaca ſylveſtris*, or Wild Parſnip. It has no *involucrum* either general or partial. Its petals are involuted and entire, and its leaves are ſimply pinnated. The general umbel conſiſts of about ten radii, and the partial of as many more. You will find it in the Claſs and Order *Pentandria Digynia*.

Obſerve

Obſerve that plant of an umbelliferous appearance, whoſe innumerable ſmall flowers are of a beautiful red-purple: they are generally white. It is of the Claſs and Order *Syngeneſia Polygamia ſuperflua:* you will accordingly find that the *floſculi* in the diſk contain *ſtamina* and *piſtilla*; and thoſe of the radius, which are about five in number, *piſtilla* only. It is the *Achillea millefolium*; in Engliſh, Yarrow. It is called *millefolium*, from the numerous diviſion of its leaves. There is an engraving of this plant in the *Flora Londinenſis*, in which the flower is drawn with too little attention to perſpective. *Achillea.*

That noble plant, among the corn, with beautiful purple flowers on the top of imbricated black-green globes, is of the ſame genus, and conſequently of the ſame Claſs and Order, with the *Centaurea cyanus* or Blue-bottle, which you examined laſt month: accordingly, you will find, that the exterior *floſculi* have no *piſtillum*; that they are tubular, larger *Centaurea.*

than thoſe of the diſk, and irregularly divided. It is the *Centaurea ſcabioſa*, Great Knapweed or Matfellon. The flowers, you obſerve, are ſingle and raiſed on long naked ſtalks. The ſcales of the calyx are edged with a brown fringe; but, what particularly diſtinguiſhes the ſpecies, is the pinnatifid leaves. The *Centaurea nigra*, which generally grows in meadows, reſembles this plant; but it has no neutral *floſculi*, its leaves are lance-ſhaped, and the flowers leſs.

Scabioſa. You ſee, among the corn, a very tall, ſlender, plant, with long peduncles, each ſupporting a ſingle pale-purple flower. The ſtem meaſures at leaſt four feet and a half. I take particular notice of it, becauſe its natural ſize is about a third of that height. If you now examine the flower, you will find, that it conſiſts of a number of ſmall *floſculi*: You conclude, therefore, without heſitation, that you are to look for it in the Claſs *Syngeneſia*. You are miſtaken. Nature would ſo have claſſed it; but Art tyrannically tears it from its

its relations. It wants the eſſential characteriſtic of the Claſs *Syngeneſia:* its *ſtamina* are not united. If you examine any of the *floſculi*, you will find, that they contain four *ſtamina* and one *piſtillum:* therefore you muſt turn to the Claſs *Tetrandria*, and Order, *Monogynia*. *Scabioſa*, the ſecond plant in this Claſs, is the *genus*, and *arvenſis* the ſpecies. The *genus* is determined by the common *calyx* conſiſting of many leaves, and the proper *calyx* being double and above the germin. The ſpecific character is — *corolla* quadrifid, radiant; leaves oppoſite; pinnatifid, ending in a lance; ſtem cylindrical and rough. You will find a good engraving of this plant in the *Flora Londinenſis*, except that it appears rather dwarfiſh.

Among that wheat you ſee a bright purple flower, which for ſimple elegance is not ſurpaſſed by any of the exotics in our gardens, green-houſes, or hot-houſes: but we eſtimate things, not by their beauty, but by their ſcarcity; elſe who would exchange ten guineas for Cromwell's halfpenny? *Agroſtemma.*

ny? This plant is too common for general admiration. It is eaſily diſtinguiſhed by the colour of its five obcordate petals, and by the extreme length of the ſegments of its monophyllous *calyx*. You will find it to be of the Claſs and Order *Decandria Pentagynia*, and of the *genus* Agroſtemma, of which four *ſpecies* have been diſcovered in different parts of the world; but this, our Cockle, to which Linnæus has given the trivial, or ſpecific, name of *githago*, is the only one indigenous in this kingdom. There is an excellent engraving of it in the *Flora Londinenſis*.

Daucus. There is an umbelliferous plant in bloom, the name of which, from the deſcription of modern Botaniſts, it is impoſſible, in its preſent ſtate, to diſcover; becauſe both the generic and ſpecific deſcriptions, given by Linnæus, depend principally on the ſeeds, which are not yet formed; but, by applying the root to your noſe, you will immediately tell me, it is a Carrot. It is indeed the *Daucus carota*, the Wild Carrot,

rot, and differs only from that which is cultivated in our gardens, in the colour and ſubſtance of its root, which is the effect of culture. You will find, on examination, that it is of the Claſs and Order, *Pentandria Digynia*. Linnæus's generic character is: *Corollæ ſubradiatæ, omnes hermaphroditæ. Fructus pilis hiſpidis:* and his ſpecific diſtinction, *Seminibus hiſpidis, petiolis ſubtus nervoſis.* To this may be added, from Relhan, that the ſtem is ſulcated and alſo hiſpid; that the general *involucrum* conſiſts of many pinnatifid leaves; that the umbels have 40 radii, and the *umbellulæ* 30.

I ſee a beautiful blue flower in the border of this corn-field, which it would have been criminal to overlook, as it is, in its wild ſtate, peculiar to this county. You are well acquainted with it as a garden flower. It is the garden Larkſpur, but growing wild in great abundance, and variety of colour, in almoſt every part of the extenſive fields ſouth of Cambridge. The Linnæan name is *Delphinium conſolida*, of the Claſs and Order Polyandria Trigynia.

If

Dipſacus. If you had ever lived in any part of the kingdom where woollen cloth is manufactured, you would immediately have recognized that upright plant with large oval heads, growing, in numbers, by the ſide of this ditch. It is the *Dipſacus ſylveſtris*, the Wild Teaſel, of the Claſs and Order *Tetrandria Monogynia*. It is, indeed, not the ſpecies uſed in the woollen manufactory; but there is ſo little difference between this and the *fullonum*, that Linnæus conſidered the latter as a variety of the *ſylveſtris:* nevertheleſs there is certainly a ſpecific diſtinction. In the *D. fullonum*, the *paleæ* of the *receptaculum* are hooked downwards: in the *D. ſylveſtris*, they are ſtraight. In the *D. fullonum*, the leaves of the *involucrum* are ſhort and horizontal: in the *ſylveſtris*, they are long, and, as you ſee, encircle the head. The generic character is — Calyx *communis* polyphyllus; *proprius* ſuperus. *Receptaculum* paleaceum.

The uſe of the Teaſel in the manufactory of woollen cloth, is to lay the pile all one way, before it is put in the hot preſs. For this

this purpoſe about a ſcore of the heads of the Teaſel are fixed in a wooden frame, or croſs, and bound together by a ſmall cord. This inſtrument is drawn along the wet cloth lengthwiſe, forcibly and repeatedly, the piece being ſuſpended over a perch, and gradually drawn from one end to the other, till the whole has undergone this diſcipline.

The Cloth-dreſſers, in the North of England, ſometimes ſhut themſelves up, for the clandeſtine purpoſe of uſing, inſtead of theſe legal Teaſels, *Cards* with wire teeth, ſimilar to thoſe which are uſed for carding wool. Theſe *Cards* were ſuppoſed to injure the ſubſtance of the cloth, an act of Parliament was therefore obtained to prohibit their uſe; but they are more durable and conſequently leſs expenſive. Probably we learnt this application of the Teaſel from the Germans, who have given it a name expreſſive of its uſe. They call it *Kartendiſtel*, that is, Card-thiſtle.

Vale.

LETTER XXXIII.

JULY.

I PROMISED you, in a former letter, an excurſion to the celebrated Chalk-pit Cloſe at Cherry Hinton: celebrated, becauſe it contains a great variety of plants; becauſe it was frequently viſited by Ray, the father of Engliſh Botaniſts; and becauſe my worthy friend Relhan, on this ſpot, recovered the long loſt *Athamanta libanotis:* I ſay *recovered*, becauſe Dr. Withering in the firſt volume of his *Botanical Arrangement* miſtakes the fact, in ſaying that Mr. Relhan firſt diſcovered this plant in Britain. Mr. Relhan never pretended to any ſuch original diſcovery, well knowing that Ray had found it on Gog-magog hills; but, no Botaniſt, ſince Ray's time, before Mr. Relhan, had been able to find it. He claims only the merit of diſcovering a plant, which, for many years, had been totally loſt. This explanation is the more neceſſary, becauſe Dr. Withering, in the firſt part of his third volume, lately publiſhed, deviates ſtill farther from the truth, in quoting the authority

rity of Mr. Woodward. But you will not, to day, have the ſatisfaction of ſeeing this ſcarce plant, as it does not flower till Auguſt.

The Chalk-pit Cloſe will afford us ſufficient matter for this day's amuſement; we ſhall therefore not begin till we come upon the field of action: and, to ſatisfy your curioſity as to the number of plants now in bloom within the ſmall compaſs of this Chalk-pit Cloſe, the beſt way will be to collect them in your tin-box, and we will afterwards ſit down and examine them.

Well — now open your budget.

No. 1. It is the *Carduus acaulis*, Dwarf Thiſtle. You will find it, in your Synopſis, the tenth ſpecies of this *genus* in the Claſs and Order *Syngeneſia, Polygamia æqualis*. Its having no ſtem is a ſufficient diſtinction. Sometimes it is found with a ſtem an inch or more in length. This ſpecimen has no ſtem at all. *Carduus acaulis.*

No. 2. *Verbena officinalis*, Vervain. You will find it the firſt *genus* in the Claſs *Verbena.*

Claſs and Order *Didynamia Gymnoſpermia*; and there can be no doubt of the *ſpecies*, as there is but one. The flower, you obſerve, is ſo very minute, that to convince yourſelf of its Claſs and Order you muſt have recourſe to your glaſs; and alſo of its *genus*, which depends on the *calyx* being monophyllous, with one of its five teeth truncated, and on its having four ſeeds. You will know the *ſpecies*, by the ſpikes being very long with a few reddiſh pale blue flowers near the extremity, by its having a ſingle ſtem, and the leaves oppoſite and with numerous clefts.

It ſeems very extraordinary that this inſignificant plant ſhould have acquired ſo much importance in ancient times. Pliny tells us it was carried by Embaſſadors when they were ſent to demand ſatisfaction for depredations, and that he who carried the plant was called *Verbenarius*. He alſo informs us that is was uſed for ſweeping the table of Jupiter—*His Jovis menſa verritur, domus pergantur luſtranturque.*

From Livy we learn that the plant Verbena was uſed in the ceremony when the league

league was ratified between Tullius Hoſtilius, third King of the Romans, and the Albans. It was alſo uſed in incantations.

Effer aquam et molli cinge hæc altaria vitta;
Verbenaſque adole pingues et maſcula thura.

This Verbena *pinguis* cannot poſſibly be the plant we call Vervain; unleſs, in compaſſion to the poverty of the Latin language, we tranſlate it freſh, *full of juice.* I recollect another paſſage in Virgil, as little applicable to our Vervain. In the fourth book of the Georgics, ſpeaking of the old Corycian's garden,

Hic rarum tamen in dumis olus, albaque circum
Lilia, verbenaſque premens, veſcumque papaver,
Regum æquabat opes animis.

So that this contented old man thought himſelf as rich as a King, with a few ſtraggling cabbages, ſurrounded by lilies, vervain and poppies; the laſt of which ſeems to have made part of his food, unleſs we tranſlate veſcum *meager*, a ſenſe in which, I think it is ſometimes uſed; but as to this border of Vervain, if it be our plant, it could neither be for uſe nor ornament. Probably ſuper-

ſtition introduced it into the gardens of the ancients. On the ſame foundation a quack in this kingdom, a few years ago, publiſhed a pamphlet on the infallibity of the root of Vervain, worn round the neck, for the cure of the King's Evil. It was thought, by the ancient phyſicians, to poſſeſs great medical virtues. It is juſt as uſeful in Medicine, as in the art of Incantation.

Convolvulus. No. 3. *Convolvulus arvenſis*, Small Bindweed: *Pentandria Monogynia.* The corolla, you obſerve, is campanulate and plaited, and the piſtillum has a double *ſtigma.* The ſtems are generally numerous, weak and trailing. The leaves are ſhaped like the head of an arrow, with three acute points: In the *Convolvulus ſepium*, Great Bindweed, the two poſterior angles of the leaf are truncated. The flowers are white, as in this ſpecimen, or pale pink.

No. 4. *Anthyllis vulneraria*, Ladies-finger. This is an old acquaintance: you have examined it laſt month.

No. 5.

No. 5. *Verbaſcum thapſus.* Great Mullen: *Pentandria Monogynia.* The corolla has a very ſhort tube, is fixed below the germen, and has 5 obtuſe ſegments. The ſpecies you will diſtinguiſh by its decurrent leaves; its ſix-feet ſimple ſtem, terminated by a long cloſe ſpike of yellow flower, and by the greeniſh-white flannelly appearance and feel of the entire plant. *Verbaſcum.*

No. 6. *Campanula glomerata:* Canterbury-bells. The corolla you obſerve is regular, of one petal and below the germen: it is bell-faſhioned, and cloſed at the bottom by 5 valves which ſupport the ſtamina. The *ſtigma* is trifid: theſe particulars conſtitute it a Campanula, and the ſpecies is characterized, by the ſtem being erect, angular, ſimple; and the flowers, generally blue, growing three together in the alæ of the leaves. Relhan obſerves that the height of the ſtem varies from three feet to three inches. *Campanula.*

No. 7. *Liguſtrum vulgare:* Privet. This you ſaw laſt month.

Rubus. No. 8. I need not tell you, that this is the common Bramble, or Blackberry. It is the Rubus of Linnæus and of all former ſyſtematic Botaniſts. The Claſs and Order are *Icoſandria Polygynia.* The generic character is perfectly diſtinct and obvious, viz. *Calyx* quinquefid: *Petala* five: Berry compoſed of many ſmall ones with a ſingle ſeed in each. Linnæus enumerates no leſs than twenty ſpecies of this *genus*, of which no more than five are natives of Britain, and but two of Cambridgeſhire, namely, the *Cæſius*, Small Bramble or Dewberry, and this *Fruticous* or Common Bramble. It is diſtinguiſhed by its long, trailing, ſpinous, ſtem; by its 3 or 5-fingered leaves, white flowers and black fruit.

Carduus eriophorus. No. 9. *Carduus eriphorus.* Woolly-headed Thiſtle. This Thiſtle may be immediately diſtinguiſhed by the ſingularity of its leaves which exactly

actly reſemble a *Cheveau de Frize*, their ſegments pointing four different ways, and terminated by a ſharp thorn, which is the only thorn upon them. The lowermoſt of theſe leaves are frequently eighteen or twenty inches in length.

No. 10. *Papaver rhoeas*, which you are already acquainted with.

No. 11. Is the little plant *Euphraſia officinalis*. It frequently grows much higher than this ſpecimen, the ſtem of which is not above four inches. You will find it in the Claſs and Order *Didynamia*, *Angcoſpermia*. The *calyx*, you obſerve, is of one leaf, cylindrical, quadrifid, the ſegments not quite equal. Now take your glaſs and you will diſcover, that the *antheræ* are purple, with each two lobes with a ſpine at the baſe. The *corolla* is ringent. Such is the *genus* Euphraſia, of which there are, in all, ſeven *ſpecies*. We have in this kingdom but two of them. This which you have gathered, is called *Euphraſia.*

ſimply Eyebright; the other, *E. odontites*, or Red Eyebright. As the firſt was to cure diſeaſes of the eyes, ſo the latter, as I ſuppoſe from the ſpecific name, was deemed a remedy for thoſe of the teeth. They are eaſily diſtinguiſhed. Of the *officinalis* the flowers are generally white or purpliſh; the ſtalk purple and about 5 or 6 inches long; the leaves oval in pairs with very ſharp teeth. Of the *odontites*, the flowers are fleſhcolour, in lateral ſpikes; the ſtem green, much branched, ten or twelve inches long; the leaves are lance-ſhaped, thinly indented and moſt of them purple.

Orchis, pyramidalis.

No. 12. I ſhould imagine, that the moment you beheld this beautiful purple flower, you were ſtruck with a family reſemblance to a plant which you examined two months ago. It is indeed of the ſame genus with the *Orchis morio*, which we met with near Impington, in the month of May. This is called *Orchis pyramidalis*, Pyramidal Orchis, which appellation,

pellation, alluding to the ſhape of the ſpike, is almoſt ſufficient to diſtinguiſh it from any other *ſpecies*; but if you add, that the horn is remarkably long; that the ſtem is ten or twelve inches in length, and entirely inveloped by its leaves, you will be in no danger of miſtaking it for any other Orchis.

No. 13. *Plantago major*. Great Plantain. Of the Claſs and Order *Tetrandria Monogynia*. Theſe very minute flowers are an inſuperable objection to the Linnæan ſyſtem. If, however, the uſe of a ſyſtematic arrangement of plants be only to trace them to their *generic* and ſpecific names, the *habitus* of the Plantains is ſo obviouſly diſtinct, that we may leave ſyſtem out of the queſtion. This *ſpecies* is known by the leaves being broader, ſlightly indented, and not downy, and by the antheræ being purple, and the ſpike longer than in *Plantago media*, from which in appearance it differs very little. *Plantago.*

No. 14. That is the *Hedyſarum onobrychis*,

which you ſaw in our laſt excurſion to the hills.

Hypericum. No. 15. *Hypericum perforatum*, Common St. John's-wort; of the Claſs and Order *Polyadelphia Polyandria:* you perceive, accordingly, that the numerous ſtamina are united at the bottom in three *faſciculi*, not very diſtinctly indeed, but ſufficiently obvious to bring the plant within the pale of this Claſs. Linnæus's character of this genus is—*Calyx quinquepartitus: Petala quinque: Filamenta multa, in quinque phalanges baſi connata: Capſula ſubrotunda*—But, in this plant, there are only three phalanxes of *ſtamina:* No matter. The character agrees with moſt of the *ſpecies*, of which there are no leſs than 42. Eight of theſe have been found in this kingdom, two of which are wanting in Cambridgeſhire. This *Hypericum perforatum* is diſtinguiſhed by its being a ſtraight ſlender plant, about two feet high; its upper branches terminated by yellow flower, with 3 divaricating *ſtyli* in the centre

centre of each; a black ſpot on the antheræ, and the leaves apparently perforated. Hypericum is the only *genus* of the Claſs, that is a native of Britain.

No. 16. *Carduus criſpus*, or Curled Thiſtle. This plant has cauſed ſome confuſion among our Engliſh Botaniſts. Hudſon's *C. criſpus* is the *acanthoides* of Linnæus, and his acanthoides, the *criſpus* of that author. Dr. Withering rejects the *criſpus* of Linnæus, and ſubſtitutes a new ſpecies which he calls *C. inclinans*. Old Bauhinus very properly calls it *Carduus ſpinoſiſſimus anguſtifolius vulgaris*. It is indeed prickly all over. It reſembles moſt the *C. nutans*, Muſk Thiſtle; but differs in the decurrent leaves covering the entire ſtem: it is alſo ſaid to be rather more ſtiffnecked than the *nutans*. I have not found it ſo. But there is a peculiarity obſervable in this *criſpus*, which, I believe, no writer has taken notice of. It is ſo delicately ſenſible of the night air, that towards evening it conſtantly *Carduus criſpus.*

ſtantly turns its face from the wind, and then ſhews its naked white neck behind, like that of a nodding Mandarine on the chimney-piece. Four ſpecies of Thiſtles you will ſee, in great abundance, in the road to Trumpington, viz. The *Onopordum acanthium*, or Cotton Thiſtle; *Carduus lanceolatus*, or Spear Thiſtle; *Serratula arvenſis*, or Curſed Thiſtle; and the *Carduus criſpus*, or Curled Thiſtle. The firſt you diſtinguiſh immediately by its mealy appearance. The ſecond by its *dark*; the third by its light green colour, and the laſt by a ſhade between the two.

No. 17. This is the *Daucus carota*.

No. 18. And this, *Paſtinaca ſylveſtris*, both which we have before examined. Theſe are all you have gathered. You have overlooked a few; but I ſuppoſe your box would hold no more.

Vale.

LET-

LETTER XXXIV.

AUGUST.

THIS morning we ſhall pay a ſecond viſit to the Chalk-pit Cloſe, for the particular purpoſe of ſhewing you the *Athamanta libanotis*. When I firſt beheld this rare plant in company with my friend Relhan, he inſiſted on my taking off my hat; a ceremony, which, he told me, the celebrated author of the *Flora Anglica*, had moſt reverendly obſerved. You will be ſurpriſed to find, that there is nothing extraordinary in its appearance: its ſole merit lies in its ſcarcity.—Here it is. You have ſeen many common umbelliferous plants, of much the ſame appearance. Like the reſt, it is of the Claſs and Order, *Pentandria Digynia*.

The generic character of the plant is — *Fructus ovato-oblongus, ſtriatus. Petala inflexa, emarginata*; and the ſpecific character — *foliis bipinnatis planis, umbella hemiſpherica, ſeminibus hirſutis:* ſo that both the generic and ſpecific characters depend upon the ſeed. *Athamanta.*

ſeed. However, if you attend to a few obvious particulars, which I ſhall point out, you will eaſily recogniſe the plant, if you ſhould ever meet with it in any other part of the kingdom. Firſt, you obſerve, it is an umbelliferous plant, neither tall nor very ſtout; that the umbel conſiſting of many radii has a conſiderable convexity, and that it is rather grey than white. The ſtem, you ſee, is angular and unequally furrowed. The leaves are bipinnated ſomewhat reſembling thoſe of parſley, except that the *pinnæ* are ſeſſile, and that the baſe of every leaf ſheaths either the ſtem or ſtalk which ſupports the umbel. To theſe obſervations you may add, that the root is ſhaped like a carrot, though not ſo regularly ſtraight; that it is acrid but ſomewhat aromatic, and that it is bearded or fringed at the top, with a tuft of leaves like hair—*vertice barbato*, in the language of Linnæus. There is a good engraving of this plant in Relhan. The Engliſh name is, Mountain Stone-parſley, given it, I ſuppoſe, by Ray, who

who firſt found it on Gog-magog Hills.

Well—You have now had the ſatisfaction of *culling a ſimple*, which very few Botaniſts in this kingdom have ever ſeen.

There ſtands another plant of the ſame umbelliferous family. It is the *Pimpinella magna*, Burnet Saxifrage. It firſt blooms in July; ſo that you muſt have overlooked it when we were laſt here. You ſee, it has neither general nor partial involucrum; the firſt conſiſts of about 14 *radii*, and the latter from 10 to 18, according to Relhan. I have generally found them nearly equal. The ſtem is furrowed and 2 to 3 feet high. The leaves are lobed, ſerrated, oily, and broader than they are long, but grow narrow and almoſt entire as they aſcend.—Let us now continue our walk. *Pimpinella.*

If I miſtake not, that diffuſe plant, with long crooked ſtems partly trailing, and terminated by looſe ſpikes of ſmall white flowers, is the *Theſium linophyllum*, *Theſium.*

phyllum, which Relhan has thought deſerving a plate in his *Flora*; for which reaſon you may conclude it not very common. It is of the Claſs and Order *Pentandria Monogynia*. Its Engliſh name is Baſtard Toadflax. The calyx is of one leaf, into which the *ſtamina* are inſerted. The ſeed is ſingle. The leaves are numerous, long and narrow. There are 17 *ſpecies* of this *genus*, of which this is the only indigenous in England. We might have ſeen it in flower above a month ago.

Ophrys. That plant with a ſingle ſtem about ſeven inches high with a ſpike of greeniſh white flowers, running ſpirally to the top, is nearly allied to the Orchis family; and it was ſo called by Ray and other Botaniſts. Its preſent generic and ſpecific appellations are *Ophrys ſpiralis*. Its Claſs and Order are, *Gynandria Diandria*. It differs from the Orchis only in the form of the *nectarium*, which, in the Ophrys, is ſlightly carinated underneath. If you take up the root, you will find ſeveral long bulbs, which,

which, with the ſpiral diſpoſition of the flowers, ſufficiently aſcertain the *ſpecies*. The Engliſh name is Tripple Ladies-traces. There are no leſs than 28 *ſpecies* of this *genus*, eleven of which are natives of this kingdom.

That plant, about a foot high, with ſeveral branched ſtems, terminated by bunches of blue cup-faſhioned flowers, is of a very irregular *genus*, which, therefore, ſolicits your attention. It is a *Gentiana*, of which Linnæus enumerates 39 *ſpecies:* of theſe, five only are natives of this iſland. They are according to Linnæus, of the Claſs and Order *Pentandria Digynia*; but of theſe five, two properly belong to the Claſs *Tetrandria*, where you will find them in the *Synopſis*; and where they certainly ought to be. If the prime diſtinction, that of Claſs, be not abſolute, the ſyſtem is of no uſe to a young Botaniſt. This plant, however, which you have gathered, has five *ſtamina*. It is the *Gentiana amarella*, Autumnal Gentian, or Felwort. *Gentiana.*

The

The generic character is: *Corolla* monopetalous; *capsula* bivalve unilocular; *receptaculum* two, longitudinal. The Linnæan character of the *species* is *corollis quinquefidis hypocrateriformibus, fauce barbatis.* But, says Relhan, *numerus segmentorum calycis et corollæ, nil valet:* so that you must depend principally on this beard, which, by the bye, is inside the mouth. The leaves, you observe, are lance-shaped. Pliny says the plant *Gentian* was so called from Gentius, King of Illyria. I do not remember the name of any other King of this country. There is indeed a Duke of Illyria, with whom I have the pleasure to be well acquainted. His name is Orsino. You remember him in *The Twelfth Night.* Sir Thomas Hanmer, in *The Winter's Tale,* alters the kingdom of Polixenes from Bohemia to Bithynia, on a supposition that it was a blunder of some transcriber; because he thinks it impossible that Shakespeare should have been so ignorant, as not to know, that Bohemia was an inland country; whereas the kingdom

which

which Polixenes governed, was, evidently, maritime. As to Shakeſpeare's geographical ignorance, there are other inſtances of it, equally flagrant. In *The Two Gentlemen of Verona*, he makes one of them *embark* at Verona for Milan, and the ſervants talk of ſaving the tide. Would Shakeſpeare have done this, if he had known that theſe are both inland cities; that they have no communication whatever by water, and that there is no tide in the Mediterranean. Sir Thomas Hanmer was certainly right in blotting out the abſurd Bohemia; but Illyria would have been a better ſubſtitute than Bithynia, which Bithynia was ſituated on the black Sea, oppoſite to the preſent Conſtantinople. This Bithynia appears, from a line in Claudian, to have been very anciently called Thrace.

Thyni Thraces erant, quæ nunc Bithynia fertur.

Probably it was peopled by a colony of Thracians croſſing the Boſphorus, and therefore called *Thracia Aſiatica*. Now it is very improbable that Antigonus, who embarked

from Sicily for no other purpoſe than to expoſe the infant, ſhould make a long voyage, through the Archipelago to the Black Sea. But Illyria bordered on the Adriatic, at a moderate diſtance from Sicily. Theſe geographical truths are indiſpenſably neceſſary in every repreſentation, though fabulous. The majority of an Engliſh audience may bear an embarkation from Verona; but what would an Italian ſay, who might be preſent at the repreſentation? Would he not naturally whiſper to his companion — "This great Shakeſpeare of the Engliſh, was an ignorant blockhead." I have as ſincere a veneration for the memory of Shakeſpeare, and feel his beauties as exquiſitely as any of his moſt enthuſiaſtic commentators; but no veneration for authentic abſurdities ſhould prevent me from obliterating his palpable miſtakes.

If you can bear the ſudden tranſition from his Illyrian Majeſty to a heap of rubbiſh — from a King to a dunghill — this waſte will afford you ſome inſtruction, and, conſequently, I preſume, ſome pleaſure. Pleaſure is the object of purſuit of all mankind; but, notwithſtanding its ſeeming reality, from its appearing in a different ſhape

to

to almoſt every individual, one would be apt to ſuppoſe it a phantom, an *ignis fatuus*. You are yet a ſtripling. You have ſcarce looked into manhood; it cannot therefore be expected that you have thought much about the matter. At your age, ſenſual pleaſures are powerfully attractive; but powerful as they are, you cannot avoid reflecting, that you have them in common with the brute creation; it were therefore too degrading to human nature to ſuppoſe, that ſenſual pleaſure is its *ſummum bonum*; that, with faculties ſo infinitely ſuperior to the animal world, man was created incapable of pleaſures above thoſe enjoyed by other animals, and probably by them in a higher degree.

From theſe reflections, you are naturally induced to direct your attention towards the pleaſures of the mind, as moſt congenial to your rank in the creation; and I will venture to aſſure you, that nothing will afford you ſo much pleaſure as the purſuit of knowledge. The celebrated Dr. Prieſtley, in a preface to one of his philoſophical publications, very pleaſingly and ingeniouſly ſuppoſes, that he ſhall carry his multifarious acquirements to the next world, and, very

rationally, conſiders his inſatiable thirſt of knowledge, as a powerful argument in proof of a future ſtate.

Chenopodium. You obſerve a plant, about a foot in height, near that dunghill; with ſhort, ſpread, flat bunches of green flowers, and leaves ſomewhat reſembling, in ſhape, the foot of a gooſe, and not very unlike the leaves of a nettle. It is the *Chenopodium murale*, Gooſe-foot or Sowbane, of the Claſs and Order *Pentandria Digynia*. The *calyx* is pentaphyllous and pentagonous: *corolla* it has none. Its leaves are gloſſy, and the whole plant has a diſagreeable ſmell. By theſe circumſtances you will diſtinguiſh it from the other ſpecies of which there are twelve in this kingdom, and twenty in all. The *genus* is eaſily known by the green flowers, the gooſe-foot leaves, and their growth near dunghills and among rubbiſh.

Our homeward rout now lies along the verdant banks of this rivulet

——— *varios hic flumina circum*
Fundit humus flores.

If

If you pull one of thoſe bunches of ſmall cream coloured flowers, you will find they have a ſtrong kernel odor. They reſemble apparently the flower of the common Elder; but you will find them of the Claſs and Order, *Icoſandria Pentagynia*. It is the *Spiræa ulmaria*, Meadow-ſweet. You cannot miſtake the *genus*, becauſe there are, in this kingdom, but two of this Claſs and Order, one of which is the Wild Pear-tree. There are alſo but two ſpecies of the *Spiræa*. The other is the *S. filipendula*, Dropwort: it is a much leſs plant, and is particularly diſtinguiſhed by the oblong glands at the extremity of the fibres of its root.

That plant with purpliſh red flowers, of four obcordate petals, with leaves reſembling thoſe of the Willow, is the *Epilobium hirſutum*, Large-flowered Willow-herb, or Codlings and Cream, ſo called from its ſmell, which has been ſuppoſed to reſemble the ſmell of apples and cream. You will find it to be of the Claſs and Order *Octandria Monogynia*. The genus is characterized by its five-leaved *calyx*, four petals, oblong *Spiræa.*

capſula, and downy ſeed; and you will diſtinguiſh the ſpecies by the flower being much larger than that of any other *Spiræa*, and by its ſtem and leaves being hairy.

Carduus. On the oppoſite ſide of the rivulet I ſee a ſpecies of Thiſtle which we have never yet met with. It differs ſufficiently, in appearance, from the reſt. Its flowers are of a deeper purple, and grow two or three together like a cluſter of filberds. The calyx is cloſely imbricated and ſmooth. The upper leaves are few, narrow, and often curled. It is the *Carduus paluſtris*, or Marſh Thiſtle.

We have, I believe, examined, in our ſeveral perambulations, at leaſt, fourſcore different plants, of various Claſſes, Orders, Genera and Species: a ſmall number, in proportion to all the indigenous plants of this iſland; but a number amply ſufficient for a botanical foundation. In the ſucceeding months, were we to continue our excurſions, we ſhould meet with few plants in flower that would either add to your botanical

tanical knowledge, or call to your recollection a line in any claſſical author; except the *Hedera*, which Virgil tells us, indicates a cold ſoil.

——— *at ſceleratam exquirere frigus*
Difficile eſt: piceæ tantum, ſaxique nocentes
Interdum, aut hederæ pandunt veſtigia nigræ.

Nigræ, I ſuppoſe, becauſe the berries are black. That poets were crowned with Ivy we learn from this line.

Paſtores hederâ creſcentem ornate poetam.

You will not find the Ivy in bloſſom till October: it is of the Claſs and Order *Pentandria Monogynia.*

You are now qualified to proceed with eaſe, if you feel delighted in the purſuit: if not, you have learnt no more than, I ſhould imagine, every man who has had the advantage of an Univerſity education, ought to know. But, in the Sciences, alps on alps are continually ariſing before us. Happily for the Enthuſiaſt in knowledge, he is in no danger of weeping with the Macedonian madman, that there are no more worlds to conquer. In the Linnæan Syſtem of Botany,

the moſt numerous Claſs of Plants, we have left entirely unnoticed, I mean the *Cryptogamia*. Of theſe I purpoſe to give you a general idea in my next letter, mean while,

Adieu.

LET-

LETTER XXXV.

CRYPTOGAMIA, from κρυπτος *occultus* and γαμος *nuptiæ*, you know is the twenty-fourth Claſs in the Linnæan Syſtem. You alſo know that it is ſo denominated becauſe the *modus propagandi* is concealed, either from minuteneſs, or within the fruit: in the language of Linnæus, *nuptiæ clam celebrantur*. The Orders are four, viz. *Filices*, *Muſci*, *Algæ*, *Fungi*.

FILICES. This Order comprehends the plants commonly known by the name of Ferns, whoſe fructification is on the back-ſide of the *frondes*, or leaves. The *genera* which have been diſcovered in this kingdom are,

Equiſetum, Horſe-tail. The plants of this *genus* bear no reſemblance to Ferns: they are ſhaped rather like little Pines, from one to three feet high. They elevate their fructification on the top of a naked ſpike proceeding from the root. The ſtem and leaves are compoſed of tubes inſerted into each other at

at the joints, which leaves ſtand in whirls gradually diminiſhing to the top. If you ſhake a little of the duſt from the ſpike on a ſheet of white paper, and examine it with a good glaſs, you will ſee it ſkip, as if it were alive. There are of this genus ſeven ſpecies, ſix of which have been found in this kingdom. In the *Flora Londinenſis* you will ſee a good print of the *Equiſetum arvenſe*.

Ophioglossum. Of this genus there are nine ſpecies, but one of which has been found in Britain: it is the *O. vulgatum*, common Adder's Tongue. Its generic character is—*Spica articulata, diſticha; articulis tranſverſim dehiſcentibus.* It is a ſingle, thick, oval, leaf, without rib or veins, on a foot-ſtalk four inches long.

Oſmunda. Of theſe the ſpike is branched, and the capſules globular. There are four ſpecies in this kingdom. One of them is the *O. ſpicans*, you will find it in *Curtis*. We call it Rough Spleenwort. The ſeeds are only on the center-leaves, which are more erect and the wings more diſtinct.

Acroſ-

Acroſtichum. Fructifications cover the entire diſk of the leaf. We have two *ſpecies* of this *genus.* They both grow out of the fiſſures of rocks in Wales, &c.

Pteris aquilina. This is our only *ſpecies* of this *genus,* though there are, in different parts of the world, no leſs than 23. It is diſtinguiſhed from other ferns by the fructifications being in marginal lines. It is our moſt common Fern, or female Fern, or Brakes, or, in Yorkſhire, Brackons. It is that ſpecies commonly burnt for the aſhes, which yield a large proportion of vegetable alkali. Linnæus gave it the trivial name of *aquilina,* from the ſuppoſed figure of the Imperial Eagle in the root when cut obliquely. Lightfoot ſays, that potatoes planted on this fern never fail to produce a plentiful crop; that in Normandy the wretched inhabitants are ſometimes reduced to the neceſſity of mixing its roots with their bread. I hope the revolution in France, will, in its conſequences, relieve them from this neceſſity. It was formerly much uſed medically in obſtructions of the

viſcera,

viſcera, and the root is ſtill preſcribed, in powder, as an anthelmintic.

Aſplenium. In this *genus* the fructifications are in oblique right lines on the diſk of the leaves, which are either ſimple, pinnatifid, pinnated, or decompoſite. Linnæus enumerates 28 ſpecies, of which only eight have been found on this iſland. Of the *A. ſcolopendrium* Curtis has given a good engraving. Theſe ſeveral ſpecies are in Engliſh called Spleenworts, with ſome epithet to diſtinguiſh them one from another.

Polypodium. Fructifications in roundiſh ſpots on the diſk of the leaf, in lines parallel to the nerve. We have 14 *ſpecies* of this *genus*. There are in all 78. The leaves are variouſly pinnated. In the *Flora Londinenſis* you will find a plate of the *P. vulgare*, Common Polypody.

Adiantum. Seeds in oval ſpots in the curled extremities of the leaves. Of this *ſpecies* there are 27 *genera*, of which only the *A. capillus Veneris*, True Maidenhair, is a native of Britain. It has been found on Barry iſland, Glamorganſhire, and on the iſle of Arran in Scotland.

Tri-

Tricomanes. Fructification ſolitary, terminated by a ſtyle like a briſtle, on the very edge of the leaf. Of the 13 genera deſcribed by Linnæus, we have but two, viz. *T. pyxidiferum*, and *T. tunbrigenſe*. They have both been found in various parts of the kingdom on moiſt rocks.

Pilularia. Male flowers in a line, like duſt, on the under ſide of the leaf. Females at the root globular, quadrilocular, containing many ſeeds. Of this there is but one ſpecies, the *globulifera*, Pepper-graſs It creeps along the ground like a mat. The leaves are three or four inches high, and the capſules are like pepper-corns. It is found in places that have been overflowed during the winter.

Iſoetes. Male flower, *antheræ* at the baſe of the inner leaves. Females, *capſula* bilocular, at the baſe of the external leaves. There are of this *genus* but two *ſpecies*, one of which has been found at the bottom of ſome lakes in Wales and in Scotland. Its ſpecific appellation is *lacuſtris*, Quilwort. The leaves are jointed, ſubulate, and about four or five inches long.

Theſe

Theſe eleven genera comprehend all the Britiſh Ferns, or rather let us call them *Filices:* many of them have no reſemblance to what we mean by Ferns. The next Order of this Claſs is the *Moſſes*, of which Linnæus makes eleven *genera:* nine of them are indigenous with us, *viz.*

Musci, ſaid to be derived from μοσχος, *vitulus*, a calf, a heifer, a young ſhoot, or any thing young. With what propriety, if ſuch be the derivation, this ſecond Order of the Claſs *Cryptogamia* is thus entitled, I do not underſtand: however, we tranſlate it *Moſſes*. It comprehends thoſe plants which have *antheræ* without *filamenta*; whoſe female flowers have no *piſtillum*, and whoſe ſeed is a naked *corculum*.

Lycopodium, Club-moſs: *antheræ* bivalve, ſeſſile; *calyptra* none. Of the 29 ſpecies of Linnæus, we have no more than ſix, for a deſcription of which I refer you to your *Synopſis*; and, if you have an inclination to be more minutely informed, conſult Lightfoot's *Flora Scotica*.

Sphagnum. Bog-moſs: *antheræ* operculate, mouth not bearded. No *calyptra*. There are

are but three ſpecies of this genus, all which are natives of Britain. Of the ſpecies *paluſtre*, Linnæus, in his *Flora Lapponica*, tells us, that the Lapland matrons, having dried it, will make a moſt comfortable cradle-bed of it for their infants.

Phaſcum. No *operculum*; no beard: *calyptra* minute. We have, in this kingdom, but three *ſpecies* of this *genus*. There are five in all. The generic character, of Linnæus, even in Murray's laſt edition of the *Syſtema Vegetabilium*, is *anthera operculata*; *ore ciliata:* but Curtis is poſitive that there is no *operculum*, and that the mouth is beardleſs. Of the *Phaſcum acaulon* and *ſubulatum* you may ſee a very good engraving in the *Flora Londinenſis*.

Fontinalis, Water Moſs: *anthera* operculate; *calyptra* ſeſſile, incloſed in a *perichætium*. There are but four *ſpecies* of this *genus*, which are all natives here: one of theſe Linnæus calls *antipyretica*, becauſe the Swediſh peaſants ſtuff it in between the woodwork of their chimneys, to prevent their taking fire. We call it Greater Water-moſs.

Splach-

Splachnum: anthera on a large coloured *apophyſis: calyptra* caducous. Female ſtar on a ſeparate individual. Of this, Linnæus has ſix ſpecies, but two of which are Britiſh.

Polytrichum: anthera operculate, on a ſmall *apophyſis: calyptra* villous. Female ſtar in a diſtinct individual. The five *ſpecies* of this *genus* are indigenous here. If you be deſirous of an intimate acquaintance with the *ſubrotundum*, conſult the *Flora Londinenſis*.

Mnium: anthera operculate: *calyptra* ſmooth: Female, a naked bulb, frequently on a ſeparate ſtem. There are twenty *ſpecies* of this *genus*, of which we have thirteen. Nine of theſe you will find accurately engraved and deſcribed by *Curtis*.

Bryum: anthera operculate: *calyptra* ſmooth: a filament from the terminal tubercle. Of theſe there are thirty-ſeven ſpecies in the laſt edition of the *Syſtema Vegetabilium:* Hudſon had augmented them to forty-five, in this kingdom only. They were ſufficiently numerous already. In the *Flora Londinenſis* you will find excellent engravings of nine *ſpecies*.

Hypnum.

Hypnum. Differs from the two laſt genera only, in a lateral filament from the *perichætium.* Of this genus there are fifty *ſpecies*, about forty of which have been found in Britain. Curtis has three of them.

In Lightfoot's *Flora Scotica*, at the concluſion of this laſt Order of the *Cryptogamia*, you will find ſome moral and very rational reflections on the uſe and importance of Moſſes.

ALGÆ. *Alga*, you know, is a claſſical word for Sea-weeds indiſcriminately. Linnæus adopts it for the title of his third Order of the Claſs *Cryptogamia*, comprehending thoſe plants whoſe roots, ſtem and leaves are all in one. Of theſe there are twelve *genera, viz.*

Jungermannia: Male, pedunculate, naked; *antheræ* quadrivalve. Female, ſeſſile, naked, ſeeds roundiſh. We have thirty *ſpecies* of this *genus.* There is a good engraving of the *J. complanata* in Curtis.

Targionia: Calyx bivalve, including a globe. Of this there is but one ſpecies, called *Hypophylla*, or Vetch *Targionia.*

Marchantia: Male, *calyx* peltate, covered beneath by monopetalous corollæ; antheræ multifid. Female, calyx ſeſſile, campanulate, polyſpermous. There are ſeven ſpecies of this genus, four of which are Britiſh.

Blaſia: Calyx cylindrical, filled with ſeed. Of this there is but one ſpecies, called *puſilla.*

Riccia: No calyx; no corolla; antheræ cylindrical, ſeſſile, on the germen. Of theſe there are five, all which have been found in this kingdom.

Anthoceros: Male, *calyx* ſeſſile, truncated entire. Female, *calyx* ſexpartite, ſeeds three.

Lichen, Archel, or Liverwort. Male, *receptaculum ſubrotundum, planiuſculum.* Female, *farina foliis adſperſis.* Of this *genus* Linnæus has no leſs than a hundred and thirty, about a hundred of which are Britiſh. In the *Flora Cantabrigienſis* you will find engravings of three curious ſpecies of theſe Lichens, which will give you an idea of the general appearance of theſe plants.

Tremella. A mere gelly: Linnæus has eleven ſpecies: five have been deſcribed in this kingdom.

Fucus.

Fucus. Male, veſicles interwoven with hairs. Females, veſicles full of gelatinous matter. There are fifty-eight ſpecies, above forty of which are found on our coaſts. In the *Flora Scotica* you will find plates of ſix different ſpecies of theſe *Fuci*, which will give you a ſufficient idea of the *habitus* of this *genus*.

Ulva. Laver. Fructification in a diaphanous membrane. Of the fourteen ſpecies of Ulva, ten are found on our coaſt.

Conferva. Fructifications tubular, unequal, diſperſed, on long capillary fibres, either ſeſſile or floating. Of theſe we have twenty-nine ſpecies.

Byſſus. Simple down or powder. Of theſe we have eleven ſpecies.

FUNGI. This Order includes every vegetable of the Fungus or Muſhroom kind.

Agaricus. Linnæus's characteriſtic of this *genus* is—*Fungus horizontalis, ſubtus lamelloſus.* He might with as much propriety have called a tree, whoſe branches are horizontal, *planta horizontalis.* In fact there is nothing in this *genus* ho-

rizontal, except the *pileus* or hat, and that is more frequently conical. The common eſculent Muſhroom and every other fungus of that appearance are called Agarics. In the laſt edition of the *Syſtema Vegetabilium*, there are thirty-nine *ſpecies*. Mr. Relhan has deſcribed fifty in this county only. Curtis has deſcribed and delineated twelve *ſpecies*, and in the *Flora Scotica*, you will find a minute deſcription of twenty-three.

Boletus. Fungus horizontalis; ſubtus poroſus. According to this definition, the only difference between this *genus* and the laſt, is in there being pores inſtead of lamellæ or gills. Some of theſe are with and others without ſtems. In the *Flora Londinenſis* you will find a good engraving of a very ſingular ſpecies of Boletus, which Curtis accidentally met with in the year 1780, and which from its fine poliſh he calls *Boletus lucidus*, Lacquered *Boletus*. Linnæus enumerates twenty-one *ſpecies*.

Hydnum. Fungus horizontalis, ſubtus echinatus. Here again the only diſtinction is in the prickles underneath. Linnæus has

five

five ſpecies, three of which have been found on this iſland. Of the *Hydnum auriſcalpium*, there is a plate in *Curtis*.

Phallus. Fungus ſupra reticulatus, ſubtus lævis. Of this genus Linnæus has three ſpecies, one of which is the eſculent Morel. Other Botaniſts have added a fourth, which they call *caninus:* of this and the *impudicus*, you will ſee good engravings in *Curtis*.

Clathrus. Fungus ſubrotundus, cancellatus. Of this genus Linnæus has but four ſpecies. Hudſon has eight; Relhan four.

Helvella. Fungus turbinatus. Of theſe Linnæus has two ſpecies; Hudſon three; Relhan four.

Peziza. Campanulatus, ſeſſilis. Of this genus, Linnæus has eleven *ſpecies*; Hudſon fifteen; Relhan thirteen.

Clavaria. Fungus, lævis, oblongus, of which Linnæus has thirteen ſpecies, about half of which have been found in Britain.

Lycoperdon. Fungus ſubrotundus, ſeminibus farinaceis repletus. This *genus* includes Truffles and Puff-balls.

Mucor. Mould. Veſicles on pedicles. Of this Linnæus has fifteen ſpecies.

I have thus endeavoured to give you a ſketch of this infinite Claſs of vegetable productions, called *Cryptogamia*. By running your eye over the characters of the Orders and *genera*, you will acquire a general knowledge of the principles of this concealed part of the Linnæan Syſtem; and with this general knowledge you may reſt ſatisfied. If at any time, in future, you ſhould happen to have no better employment than microſcopical amuſements, the *Cryptogamia* will afford you much entertainment. And now, I fancy, we may ſay with Virgil

Claudite jam rivos, pueri, ſat prata biberunt.

Vale.

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ERRATA.

Page 3. line 11. for *Arithmatician*, read *Arithmetician*. P. 20. l. 2. for *discremination*, read *discrimination*. P. 128. l. 15. for *inquisitely*, read *inquisitively*. P. 136. l. 26. for *pilate*, read *pilot*. P. 137. l. 7. for *pilate*, read *pilot*. P. 139. l. 25. *Ullysses*, read *Ulysses*. P. 128. l. ult. for *turned*, read *tuned*. P. 218. l. 8. for *Salvitur*, read *Solvitur*. P. 222. l. 9. after *founded*, read *on*. P. 227. l. 23. for PALYADELPHIA, read POLYADELPHIA. P. 258. l. 24. for *Vegetabilum*, read *Vegetabilium*. P. 273. l. 13. for *macalatum*, read *maculatum*. P. 274. l. 15. for *rebentem*, read *rubentem*. P. 277. l. 23. for *with*, read *without*. P. 286. l. 26. for *turbular*, read *tubular*. P. 301. l. 15. after *barley*, read *and*. P. 304. l. 13. for *with*, read *without*. P. 306. l. 2. for *turbular*, read *tubular*. P. 341. in the margin, for *Spiræa* read *Epilobium*.

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